AFFECTIONS OF THE EYE
IN
GENERAL PRACTICE

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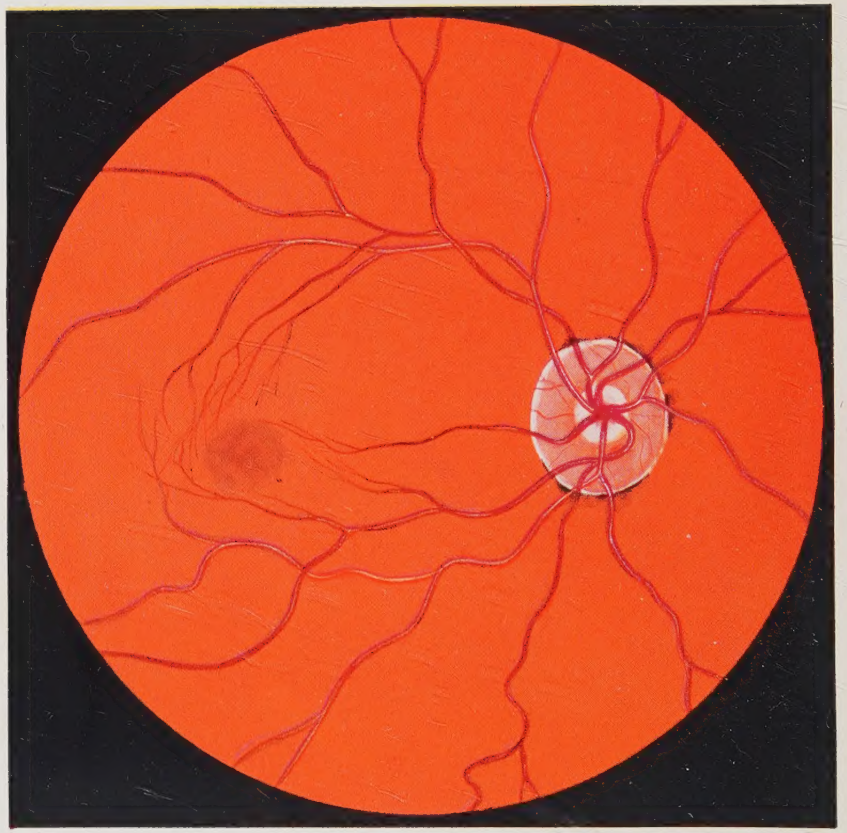

[*R. Lindsay Rea.*

FUNDUS OF A NORMAL EYE.

On the right is the optic disc with some choroidal pigment on its circumference. In the centre of disc is a normal physiological cup. Note the lighter colour of the arteries emerging from the cup and the darker veins entering it. Where arteries and veins cross there is no kinking. To the left is the normally pigmented macula.

AFFECTIONS OF THE EYE
IN
GENERAL PRACTICE

BY

R. LINDSAY REA, B.Sc., M.D., M.Ch., F.R.C.S.

SURGEON TO WESTERN OPHTHALMIC HOSPITAL; OPHTHALMIC SURGEON TO WEST END HOSPITAL FOR NERVOUS DISEASES; OPHTHALMIC SURGEON TO LONDON LOCK HOSPITALS; CONSULTING OPHTHALMIC SURGEON TO FINCHLEY MEMORIAL HOSPITAL AND TO BRITISH HOSPITAL FOR MENTAL DISORDERS AND NERVOUS DISEASES

WITH SEVEN COLOURED PLATES
AND
THIRTY-THREE OTHER ILLUSTRATIONS

LONDON
H. K. LEWIS & CO. LTD.
1930

TO THE

"G. P."

PREFACE

The dedication of this book to the General Practitioner explains at a glance my object in writing it.

At the request of the editor of the *Medical World*, Dr. A. Welply, I wrote a number of articles on "Affections of the Eye in General Practice." At the time it was considered that six or so would suffice, but as each week passed by, sufficient material was found for seventeen. From letters received both by the editor and the author, it was evident these articles were greatly appreciated and, in reply to numerous requests, they have now been somewhat amplified and put together in book form.

It is not an attempt therefore to write a text-book on Ophthalmology, nor even a grind-book, but it is, as its title indicates, merely an effort to help the General Practitioner whose ophthalmic training has necessarily been somewhat limited. A syllabus setting forth the subjects for a Final Examination in Medicine should comprise a course on Ophthalmology, but even where such exists, the student has neither the time nor the experience to gain the necessary amount of knowledge required for the treatment of affections of the eye which will be seen later in his practice. Explanations have been made as simple as possible and many pitfalls described.

The illustrations in this book are mainly original. I have, however, to thank the publishers of Schafer's *Essentials of Histology* for permission to publish Figure 13, also the publishers of Quain's *Anatomy* for permission to use Figure 33, which has been copied from a block on page 342, Volume III, Part II. In both these cases the publishers are Messrs. Longmans, Green & Co.

By kind permission of Messrs. Mayne & Boyd, Figure 32 has been adapted from Plate XXIX, Slab 5, of Professor Symington's *Atlas* published during the Great War.

The illustrations of the various instruments were kindly lent by Messrs. John Weiss & Sons, whilst the remainder have been drawn by Mr. S. Haigh, whose time has been freely placed at my disposal by Messrs. Clifford Brown, Ltd. Mr. Haigh has taken infinite pains to produce both drawings and coloured plates as faithfully as possible in order to portray the actual conditions seen. Figure 2, Plate III, was taken from a fundus painting done by Messrs. Hamblin, Ltd., of the eye of a patient under my care.

I am indebted to Dr. J. A. van Heuven of Utrecht for so kindly reading over and correcting the manuscript.

I have also to thank Miss N. McLaughlin for carefully reading the proofs and preparing the index.

Finally, I wish to thank Messrs. H. K. Lewis & Co. for their help in the production of this book.

R. Lindsay Rea.

Harley Street, W.1,
1930.

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AFFECTIONS OF THE EYE IN GENERAL PRACTICE

CHAPTER I

DISEASES OF THE EYELIDS

It will be my endeavour, in the following chapters on the commoner affections of the eye met with by the general practitioner, to make clear, as far as writing possibly can, the treatment necessary for such cases, and to indicate those which should be seen only by one whose whole time is occupied with ophthalmology.

The doctor in general practice is frequently called upon to suggest treatment which will tide the case over until further specialised assistance is obtainable. Sometimes masterly inactivity is the best treatment possible, but, on the other hand, the patient may refuse to see the specialist and insist upon his own doctor treating the case throughout, e.g. it sometimes comes about that the doctor is forced to nurse a case of glaucoma for several weeks, a case which should have been operated upon during the first three days of the attack.

There are simple rules which can guide the general treatment of most eye diseases, and it will be my object to explain, in the following chapters, the best course to pursue.

The first chapter begins with the affections of the eyelids, then gradually taking the various anatomical structures of the eye and its adnexia from before backwards in the chapters to follow.

The eyelids are composed of layers from without inwards of skin, connective tissue, muscle (orbicularis palpebrarum),

cartilage (tarsal plate), then a layer of meibomian glands and their ducts, while closely apposed to the tarsal plate and the glands which are largely embedded in the plates, is the conjunctiva (Fig. 1). At the margin of the eyelids are the eyelashes, which grow outwards from the anterior edge. At the posterior edge or lip of the margin of the eyelid the stratified epithelium of the skin passes into the columnar epithelium of the conjunctiva. On the margin of the eyelid, by means of minute orifices, open the meibomian glands. There are other small glandular ducts opening both into the hair follicles and on the surface as well.

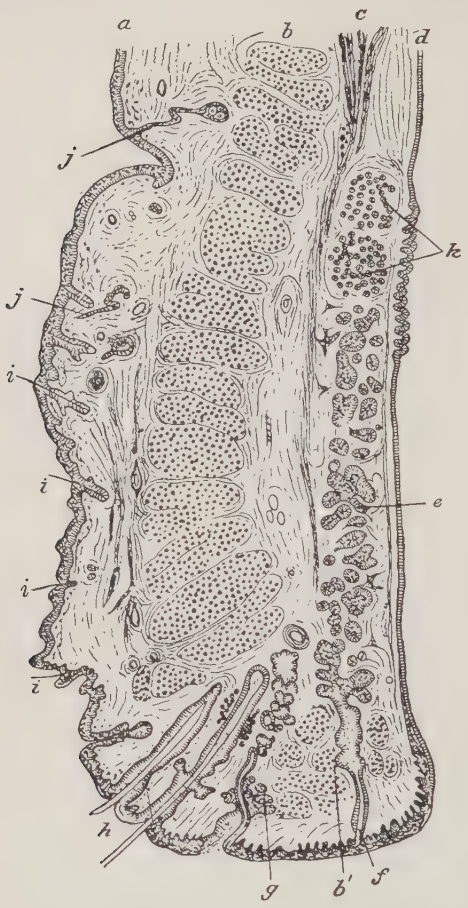

FIG. 1.—Section of Upper Eyelid (after Waldeyer).

a, Skin. *b* and *b*1, Orbicularis palpebrarum. *c*, Levator palpebræ. *d*, Conjunctiva. *e*, Meibomian glands lying between tarsal plate and conjunctiva. *f*, Duct of a meibomian gland. *g*, Henle's glands. *h*, Eyelashes. *i*, Small hairs in outer skin. *j*, Sweat glands. *k*, Posterior tarsal glands.

Infection may spread along a meibomian duct. It is a frequent complication in a common attack of conjunctivitis. Usually the lower lid, which was red, now becomes swollen, and if the outer surface of the eyelid is

palpated by the finger, a localised swelling is felt. If this swelling is not incised at once, the lid will become greatly swollen and painful. The inner surface of the eyelid should be rendered anæsthetic by rubbing a little solid cocaine on its surface. If there is a tarsal cyst forceps available (Fig. 2), slip it over the eyelid with the ring on the inner side, clamp so that the swelling is surrounded by the ring and evert the eyelid. By means of a small fine knife, preferably a Beer's knife (Fig. 3), a vertical incision is made inside the ring. Pus will at once exude. If a curette (Fig. 4) is put into the wound, and gently rotated, a small amount of soft granulation tissue will come away. The small wound will bleed freely for a few minutes, but a pressure bandage for several hours is all that is necessary. Continue the treatment of the conjunctiva with simple boracic lotion for the next two days.

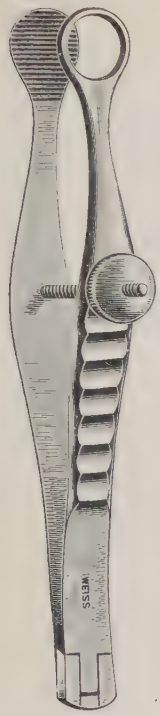

Fig. 2.—Tarsal Cyst Forceps.

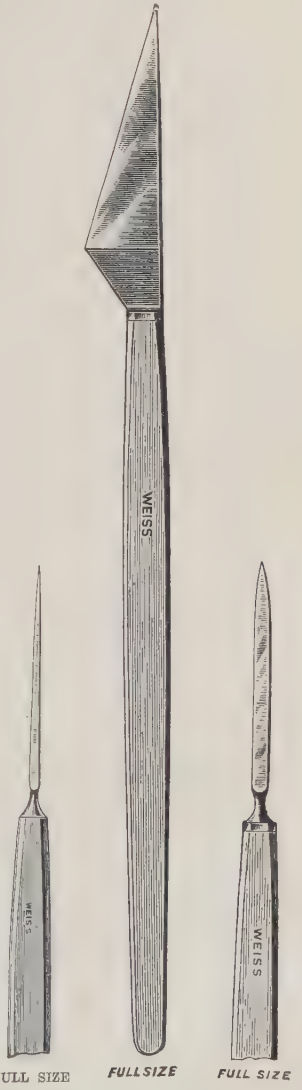

Fig. 3.—Lindsay Rea's Knife, Beer's Knife, Graefe Knife.

Chalazion

What is seen more commonly is the nonsuppurative type of meibomian cyst called a chalazion. There is not a conjunctivitis present, but a small swelling not quite at the edge of the lid, at first the size of a lentil gradually increasing to that of a pea. They are not painful, but on account of disfigurement a patient will seek advice.

Fig. 4. Tarsal Cyst Curette.

If the swelling is recent, say at the most, three months, the treatment will be exactly the same as already described for the suppurating cyst. Remember the incision must always be a vertical one. If tarsal cyst forceps are not available, the lid can be everted on the finger, the incision made, and the contents removed by means of a curette. There is not so much bleeding with this type, but it is wise to bandage the eye for a few hours. On the removal of the bandage, wash out the eye with lukewarm boracic lotion.

Occasionally hard chalazia are met with. As a rule these have been present more than three months. They consist of solid fibrous tissue, and cannot be removed by curetting. They must be removed through the skin. The operation is not at all an easy one, for frequently the small cyst cannot be distinguished from the muscle bundles amongst which it lies except by the surgeon who is constantly removing them.

The operation is done with 2 per cent. Novocaine injected subcutaneously, and cocaine applied inside the eyelid. When the skin is divided horizontally the fibres of the orbicularis muscle are parted. The cyst is seized by means of toothed forceps, and dissected out completely. It is usually found to have come through the edge of the tarsal plate. A suture is necessary to close the wound.

Hordeolum

The commonest type of swelling of the eyelid is the stye or hordeolum. This is a suppurative inflammation of Zeiss'

glands which are the sebaceous follicles of the eyelashes. In the early stages, the small gland becomes swollen, and usually the whole edge of the lid is œdematous and painful. An abscess forms, which generally points close to the roots of the eyelashes. Styes occur in crops, and often, even in healthy people, become quite a nuisance.

For this condition most parents know how to use hot compresses, and often allow the abscess to burst. It is better for the doctor, when the abscess is just pointing, to puncture it with the point of a fine knife. If the end of the handle of the knife is placed within the eyelid, gentle pressure will evacuate the pus. Then a hot boric fomentation should be applied and repeated for several hours.

If styes come in crops, the best treatment is as follows. Constant bathing with warm Boracic lotion together with a little soft ointment consisting of 10 per cent. Boracic Acid and 2 per cent. Hydrarg. Ox. Flav., this to be applied by means of gentle rubbing into the margins of the eyelid.

If styes are associated with boils, especially in adults, the urine should be tested for sugar. If styes still persist, then a staphylococcic vaccine may be employed. Tonic treatment, such as iron and arsenic, should be used. Often the correction of an error of refraction will produce good results.

It is to be understood that all instruments used in the above minor operations must be sterilised by boiling for at least three minutes.

Occasionally an abscess at the margin of the eyelid will burst its walls, and the bacteria gain access to the connective tissue beneath the skin. Some time ago I had such a case under my care. The pus had spread upwards beneath the skin and eyebrow on to the forehead. A wide horizontal incision was made beneath the eyebrow, and an eggcupful of pus was evacuated. A small rubber tube was left in the wound for 24 hours. The condition quickly subsided, and in a few weeks the eyelid was once again quite normal.

Blepharitis

Another and most unsightly disease of the eyelids is blepharitis, which is a chronic inflammation of the margins of the lids. It may appear in two or three different forms. The edge of the eyelid may appear red, which is sometimes produced by excessive smoking, and is seen commonly nowadays in young women. The cure of such a condition is the removal of the cause, together with the use of a weak astringent lotion.

The chronic variety, known as squamous blepharitis, shows small white scales resembling dandruff accumulated at the roots of the eyelashes. The eyelashes fall out readily, and so disfigurement results.

In ulcerative blepharitis, when the white scales or crusts are removed, beneath are found small ulcers which distort and destroy the hair follicles. One has seen eyelids entirely bereft of eyelashes owing to this cause. If the blepharitis is associated with a conjunctivitis, and scales have not formed, small dry particles of inspissated pus are found instead. This is one of the causes of styes, so that not only should the eyes be bathed with lotion, but the crusts removed by brisk rubbing with warm Sodium Bicarbonate lotion, 10 grs. to the oz. In the scaly form, the scales must be completely removed by the constant use of such an alkaline lotion as sodium bicarbonate, and the edge of the lids gently massaged with the finger smeared with Ung. Hydrarg. Ammon. 8 grs. to the oz. (paraffin molle) or Hydrarg. Nit dil. 40 grs. to the oz.

In the ulcerative form, the former ointment would be less painful to apply. The edges of the eyelids should be so treated night and morning. By the end of a few weeks a distinct improvement if not a complete cure will be found.

In old chronic cases the edge of the lid should be touched with a fine camel-hair brush dipped in tincture of iodine. This is painful treatment, but it gives exceedingly good results. On no account should the iodine pass the margin of the eyelid.

Ectropion

Finally, a condition sometimes found in elderly people who have suffered from a conjunctivitis is eversion of the lower lid, or ectropion. The conjunctiva round the lower eyelid has become swollen, and it is due to the swelling of this membrane that the lid becomes everted. Tears pour over the cheek, and the constant wiping aggravates the condition.

In such cases there is no need to think of operation. The simple painting, every other day, of the swollen conjunctiva with Zinc Sulphate $2\frac{1}{2}$ grs. to the oz., the patient using a much weaker zinc lotion himself several times a day, will completely restore the lid to its natural position.

CHAPTER II

AFFECTIONS OF THE LACRIMAL APPARATUS

The lacrimal gland lies deep to the outer portion of the upper eyelid, partly beneath the margin of the orbit and partly beneath the eyelid. It sometimes becomes swollen and inflamed with symptoms of suppuration; this is known as dacryo-adenitis. It becomes swollen also in Mikulicz's disease. Normally the tears pass from the lacrimal gland through fine ducts to the upper fornix of the conjunctival sac. They then pass over the surface of the eye, and are led by means of the movements of the eyelids towards the inner canthus. Here on the edge of each lid a fine papilla is seen, on the summit of which is a small aperture; this is the punctum leading into the short passage called the canaliculus which conveys the tears into the lacrimal sac (see Fig. 5). This sac, which lies in the lacrimal fossa formed by the lacrimal bone, measures about 15 mm. in length and 5 mm. in breadth. The lower end of the sac passes into the nasal duct; both sac and duct are composed of fibrous and elastic tissue adhering closely to the periosteum of the lacrimal and maxillary bones. The nasal duct opens into the nasal cavity below the inferior turbinate bone. Obstruction at any place from the punctum to the orifice of the nasal duct will produce epiphora or overflowing of the tears on to the cheek. The simplest and most general cause of this condition is stricture of the punctum. Dilatation of this minute orifice repeated several times will produce a cure.

Obstruction elsewhere, such as at the junction between the lacrimal sac and the nasal duct, is not so easily overcome. If the tears cannot pass, then a collection of mucus will take place which can readily become infected from the con-

junctival sac. Should a slight swelling lying internally to the inner canthus be discovered, it should be massaged promptly with the tip of the finger. The swelling is due to a collection of mucus in the sac, and may be forced quickly into the nose. As often as this swelling can be palpated, the process of emptying the sac by means of pressure of the finger should be repeated. Cases of suppuration of the sac can be avoided by such a procedure. After suppuration has taken place, it may be exceedingly difficult to pass the probe into the nose. The name given to a suppurating

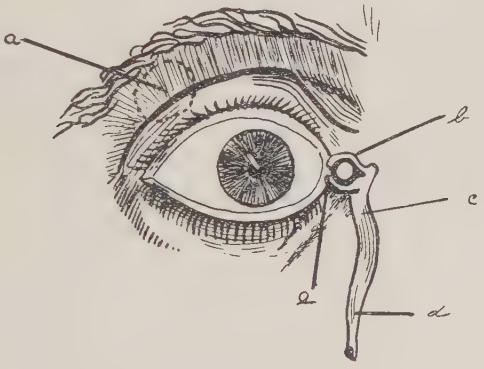

FIG. 5.—Lacrimal Apparatus.

a, Lacrimal gland. *b*, Superior canaliculus. *c*, Lacrimal sac. *d*, Nasal duct. *e*, Punctum of inferior canaliculus on edge of lower eyelid.

lacrimal sac is dacryo-cystitis, and may be acute or chronic. In the former there may or may not have been a history of tears escaping from the eye. There is an acute and painful swelling between the inner canthus and the side of the nose. The swelling may point and burst, discharging pus and tears ; the pain is excessive. The treatment of such is to open the sac by means of a small vertical incision and allow drainage of the pus to take place. Even after such a disturbance, the lacrimal passage has been found to remain patent while in others probes must be passed. In chronic cases there is a long history of regurgitation of tears, sometimes mixed with purulent discharge from the canali-

culus when the lacrimal sac is pressed upon. Such patients often awaken in the morning and find the conjunctival sac full of pus. This is a distressing condition, and nothing but complete extirpation of the sac will give the desired relief. After extirpation of the sac tears cannot pass, but as the flow of tears is only produced in excess under the strain of emotion, patients do not complain of troublesome lacrimation.

Should a young child be brought to the doctor suffering from a muco-purulent conjunctivitis of one eye only, he should inquire if the mother has noticed the presence of a continual tear in the eye. This rather common condition is due to a congenital obstruction, either where the canaliculus enters the sac or in the duct below the sac. This is a condition which should not be allowed to remain. The oculist passes a fine probe along the lacrimal passage into the nose, using several larger sizes in succession. The operation must be done under a brief anæsthetic, and the most striking results follow this procedure. A tear sac which has produced large quantities of pus for weeks will clear up within two days. The most probable explanation is to be found in the paper recently given by Mr. F. Ridley, F.R.C.S., on " The Lyzozymic Action of the Tears." As soon as the tears can pass, there is, apparently, destruction of the infecting bacteria. This is the result of breaking down the obstruction, and seldom has the operation to be repeated twice.

CHAPTER III

DISEASES OF THE CONJUNCTIVA

The eyelids are lined by an exceedingly sensitive membrane, the conjunctiva. It is closely applied to the tarsal plate. If the lid is everted, fine streaks are seen running perpendicularly to the margin. These are the ducts of the meibomian glands numbering from 20 to 30, but are somewhat fewer in the lower than in the upper lid.

Above the tarsal plate of the upper lid the conjunctiva is loose, and lies in folds. It is then reflected on to the eyeball. These loose folds permit of free movement between the eyelid and the eyeball. The conjunctiva passes across the eyeball, and is modified on the surface of the cornea so as not to interfere with the transparency of the latter. It is continued on to the lower eyelid, and is again closely apposed to the lower tarsal plate. The parts where the conjunctiva is reflected from the eyelids on to the eyeball are known as the superior and inferior fornices.

It will be seen then that the conjunctiva forms a sac, open in front (the palpebral fissure), which completely protects the eyeball and the orbit from loose foreign bodies and infection.

The conjunctiva overlaying the eyeball is a loose elastic membrane containing many blood-vessels and nerves. The ocular portion can be readily picked up with forceps, and this manœuvre is made use of when holding the eye in a fixed position during the performance of an intraocular operation.

Between the epithelium and the sclerotic is a layer of loose connective tissue. The blood-vessels lying in this tissue are almost transparent. One can see the blood

corpuscles running in rouloux through the finer arterioles by means of the slit lamp. All these vessels are intensely dilated and engorged during an attack of conjunctivitis, or during the process of repair of an injury to the eye.

On the other hand, the palpebral conjunctiva is firmly adherent to the tarsus.

The conjunctiva and the cornea are kept in a moist condition by the tears which are secreted by the lacrimal gland situated in the outer and upper part of the orbit. Normally the secretion is just sufficient to keep the surfaces of the lids and cornea moist. While under the stress of emotion tears flow freely, and the lacrimal ducts are unable to drain away the excessive amount of moisture, which therefore flows on to the cheek. The margins of the eyelids are lubricated by the secretion of the meibomian glands.

For some time after a severe attack of conjunctivitis, a considerable quantity of white mucoid secretion is found at the inner canthus which must not be mistaken for pus. This is seen particularly at the termination of an acute gonorrhœal conjunctivitis.

Bacteria are found in the conjunctival sac, carried there by dust and wind. Most of the organisms normally present are non-pathogenic. Diplococci, indistinguishable from pneumococci, are found; staphylococci are found, generally the albus variety, but in a muco-purulent attack of conjunctivitis the staphylococcus aureus is found. Streptococci, most fortunately, are rare. Occasionally B. coli also is present.

The mechanical action of the tears continually keeps the conjunctival sac clean. If the lids are bandaged, the temperature of the sac is raised, which will increase the number of bacteria. Few eyes can remain bandaged for long without a conjunctivitis appearing.

Acute or Catarrhal Conjunctivitis

Possibly the commonest form of conjunctivitis met with by the general practitioner is a simple acute or catarrhal

conjunctivitis. The eye will appear slightly reddened, with only a small amount of discharge found on the margins of the lids on waking from sleep. This condition passes imperceptibly to a more congested condition of the conjunctiva together with a thicker mucous discharge (see Plate I, Fig. 4). Various terms are applied to this condition. Amongst uneducated people it is often described as "blight," and commonly the condition is described as a "cold in the eye." Certainly cold is required to lower the resistance of the tissues in the presence of bacteria. During a recent Railway Strike many train travellers had to reach town by means of open motor-cars. Among these I saw some of the worst forms of catarrhal conjunctivitis. The disease is contagious, so that, when a patient presents himself with only one eye affected, he should be warned most urgently not to wipe both eyes with the same handkerchief. He should be told not to use a handkerchief to the affected eye at all, but to use old pieces of linen or cotton-wool, and to burn these after wiping the eye.

In poor families the disease may spread through a whole house.

If this condition spreads through a school it is known as "pink eye."

In the severer forms, when the lids are everted, pus will be found in the fornices. The epithelium of the cornea becomes slightly œdematous, so that a patient may complain of seeing coloured rings around lights. The discharge is at first mucous, but gradually becomes more purulent. The eyelashes are mattered together.

The symptoms consist of discomfort, itching, soreness. Neither pain nor photophobia is marked. If the cornea becomes involved, then the pain and photophobia are prominent. It is this form which is most generally met with by the practitioner. Most commonly it is acute, but sometimes chronic and with little discharge.

The various forms of conjunctivitis are caused by different organisms. Frequently the Kock-Weeks' bacillus is responsible. This is a very slender rod staining badly with

methylene blue. The organism is rapidly destroyed by drying. It is known to cause very definite epidemics.

If the conjunctivitis is caused by the pneumococcus, the development of a hypopyon ulcer should be borne in mind. There is more œdema, and a membranous film may form; this is known as pseudo-membranous conjunctivitis. Like the pneumococcic infection of the lungs, it ends with a crisis, the organism rapidly disappearing.

During influenzal epidemics, a conjunctivitis is often found due to the influenza bacillus.

A form of conjunctivitis may be produced by the staphylococcus aureus. Such a form is frequently found in those who work in a dusty atmosphere.

Instead of mentioning at first the various forms of treatment, let me urgently make the following rules. Never bandage an eye that is discharging. I have seen an infection spread from the bandage, over the face, and, in one case (a lady), the infection spread upwards, over the forehead, through the hair to the back of the scalp. All the hair had to be removed and large scalp fomentations applied. Remember then not to bandage an eye from which there is a purulent discharge.

Do not use Hydarg. Ox. Flav. This is the commonest mistake practitioners make when they meet this condition. The essential thing in the treatment is regular irrigation.

In a case of muco-purulent conjunctivitis, treatment is as follows. First the eye is washed out with luke-warm Boracic lotion. The lids are then rubbed over with 15 per cent. Protargol. This is not painful, and thus the agony produced by silver nitrate painting is avoided. To the patient I give Gutt. Protargol 5 per cent., to be dropped into the eye night and morning. The patient on waking finds the lids glued together. The discharge should be washed away with a little warm Boracic lotion, and a drop or two of the 5 per cent. Protargol instilled. Allow this to remain in the conjunctival sac for 20 or 30 minutes, and then wash out with Lotio. Hydrarg. Perchlor. 1/10,000. A patient should not be given a stronger lotion than this. I

have known of 1/200 Hydrarg. Perchlor. having been ordered, with most disastrous results to the cornea. The resistance of the surface cells was completely broken down, and both corneæ destroyed.

At midday the eye should be washed out with Lotio. Hydrarg. Perchlor. 1/10,000 alone. Before retiring, the 5 per cent. Protargol drops are again instilled, allowed to remain for 20 minutes, washed out with Perchloride lotion, and a small piece of 10 per cent. Boric Acid ointment (paraffin molle) applied within the lids. Such treatment will soon reduce the inflammatory condition of the conjunctiva. If the case is not doing well, it is because the patient is not carrying out the doctor's instructions properly.

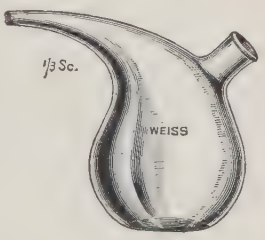

Fig. 6.—Undine.

A patient will often ask, "But how can I bathe my own eyes?" If he has someone to help, this can easily be done by dropping the lukewarm lotion from a piece of soaked cotton-wool, the lower lid being held down, allowing the lotion to gain access to the lower fornix. If it is possible to procure an undine (Fig. 6) the lotion can easily be poured into the eye.

If the case is somewhat obstinate, repeat the painting of the lids with 15 per cent. Protargol. The application of the ointment is by means of a small glass rod. The lower lid is pulled down with the forefinger, while the rod, held horizontally, places a small piece of ointment into the lower fornix. At that moment the patient is told to look down, with the result that the upper lid following, is held down by the finger over the glass rod, which is gently withdrawn sideways. This is undoubtedly the best way to put ointment into an eye.

Sometimes one is forced to use 2 per cent. Silver Nitrate, never as drops, but swabbed on the everted eyelids by means of a small piece of cotton-wool wrapped round an orange stick or match. The excess of Silver Nitrate should be washed out of the sac immediately.

Let me repeat then three "nevers." Firstly, never bandage an eye which is discharging. Secondly, never use Yellow Oxide of Mercury in such a condition. Thirdly, never use Silver Nitrate in the form of drops except at birth.

When all discharge has ceased, the eyes should be bathed thrice daily for a week with the following lotion: Pulv. Acid Boracis, grs. 16: Zinc. Sulph., gr. 1; Aqua Rosæ to an ounce, to be used with an equal quantity of warm water.

One patient I saw had not returned to her doctor, but had continued to use the Protargol for over six months. When seen the sclera of each eye appeared quite black, due to intense silver staining of the conjunctiva. This was a permanent stain.

Ophthalmia Neonatorum

Two of the most serious forms of purulent conjunctivitis are as follows: ophthalmia neonatorum occurring in newborn children, and acute blennorrhœa of adults.

It is an unfortunate fact that the general practitioner frequently sees cases of babies a few days old suffering from this disease. There are many different forms of treatment, which have produced confusion in the minds of many medical men, so that at times the most abject failures result from treatment.

This disease is a preventable one. It is acquired at birth. Credé's prophylactic treatment of dropping a 1 per cent. Silver Nitrate solution into the eyes of the infant immediately after birth has greatly lowered the incidence of this disease.

Frequently a mother at the time of the birth of her child is in grave danger, and it often happens that a doctor is so concerned with the life of the mother, that if the child appears to be healthy and vigorous, the requisite amount of attention is not given to the baby's eyes. The doctor should see the nurse actually place the drops within the baby's eyelids. If Silver Nitrate is not available, 10 per cent. Protargol can be used, but I believe the use of Silver Nitrate is the safer procedure.

PLATE I

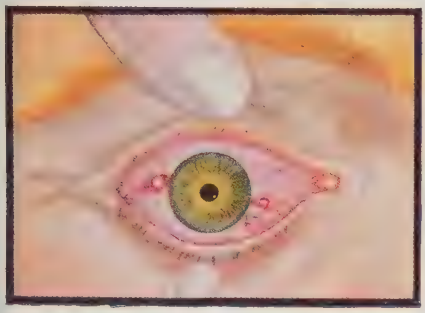

FIG. 1.—PHLYCTENULAR CONJUNCTIVITIS.

FIG. 2.—OPHTHALMIA NEONATORUM.

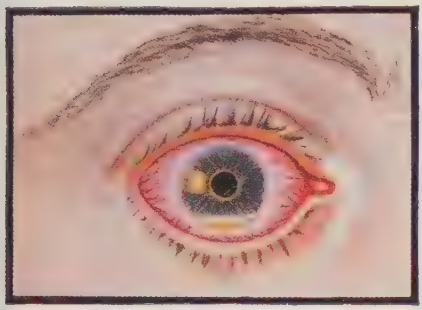

FIG. 3.—HYPOPYON ULCER.

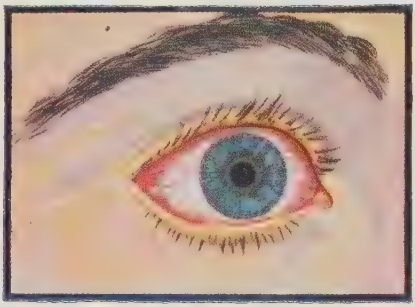

FIG. 4.—MUCO-PURULENT CONJUNCTIVITIS.

FIG. 5.—IRITIS.

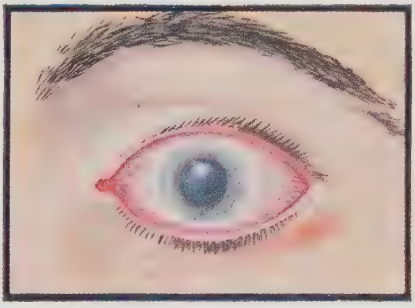

FIG. 6.—GLAUCOMA.

A further prophylactic measure is to be found on page 457 of Tweedy and Wrench's *Practical Obstetrics*, the douching out of the vagina with an antiseptic solution during the second stage of labour in all women who are found to be suffering from purulent discharges.

This disease is responsible for a large proportion of blind people. The figure varies greatly. Fuchs has placed it at 10 per cent.

The purulent discharge is usually noticed on the third day, although babies are often brought to hospital several weeks old and still suffering from the disease.

The clinical appearance is as follows. Both eyes are usually affected at the same time (see Plate I, Fig. 2). The lids are swollen and sometimes stuck together, the pus, thick and yellow, is often found oozing from between the lids. When this has been washed away, and the conjunctival sac cleansed, the bulbar conjunctiva is found to be red and swollen, but not to such an extent as the conjunctiva lining the lids. The palpebral conjunctiva is enormously swollen and bleeding in some cases.

If the lids are stuck together, the doctor should wear his glasses if goggles are not available before parting the lids, as the pus will often squirt out with some force. Pus entering the doctor's eye is an accident that sometimes occurs. Should it occur, the doctor's eye must at once be thoroughly washed out with warm Boracic lotion and his lids touched with 15 per cent. Protargol. This advice applies also to the nurse.

If the case is new, on parting the lids, the corneæ are seen to be clear, but if there has been delay in bringing the case to the doctor's notice, he may find the corneæ dim or somewhat steamy in appearance. It may be definitely ulcerated, or it may be actually perforated, with the iris as a rule filling the hole.

The method of examining such a child has been described in innumerable text-books. It is as follows. The nurse holds the child on her lap facing the surgeon. The baby's head is placed between the surgeon's knees.

The nurse holds the child's hands against its body. The surgeon steadies the head and examines the eyes. I prefer what is probably a much more useful method. While on a table, wrap the baby around with a sheet so that the little arms are pinned against the side and cannot be moved. A nurse can place a hand on each side of the baby's head to steady it, and so allow the doctor to open the eyelids and gain a good view of the conjunctiva and cornea. This should be done under a good light. It is the method we have adopted at the Western Ophthalmic Hospital.

The bacteriology of these cases is very interesting. At the London Lock Hospital, where a ward is devoted to such cases, we have found that 100 per cent. were due to the gonococcus, whereas at some of the large Ophthalmic Hospitals 70 per cent. or so were due to the gonococcus, the remainder being due to the B. coli, streptococci, pneumococci, and staphylococci. One case, which was unilateral, with half of the cornea sloughing in a 9 days old child, was due solely to the staphylococcus aureus. However, the dense yellowish pus emanating between the red swollen eyelids is pathognomonic of the true gonorrhœal ophthalmia.

The treatment of these cases is urgent. Hourly irrigation is the chief feature. At the outset the lids should be firmly swabbed once with 2 per cent. Silver Nitrate. The excess is at once washed out from the conjunctival sac. Remember, Silver Nitrate drops must *not* be used, otherwise it is certain the cornea will suffer from erosion. Neither should any strong antiseptic be used, and although many solutions have been recommended, all that is required is constant irrigation with a mild antiseptic without caustic qualities. Such a thing as a stronger solution of Hydrarg. Perchlor. than 1/10,000 should not be used. I have seen a case which was progressing favourably to have 1/200 Hydrarg. Perchlor. solution applied, with the disastrous result of both corneæ sloughing, the child being completely blinded.

What is the explanation ? The cornea is defended by

a fine epithelium which, if destroyed, can allow infection to reach the substantia propria of the cornea. I have applied 2 per cent. Silver Nitrate to the eyelids of an adult and have at once examined the epithelium with a corneal microscope and slit lamp. I found the superficial cells had been so affected as to produce the appearance of having been burnt by a caustic. No wonder some authorities believe Silver Nitrate should not be used at all. But for several years all the babies taken into the ophthalmic ward of the London Lock Hospital have at the outset had Silver Nitrate applied. Also at other hospitals one has never seen anything but good come from such treatment. I do not advocate the use of Silver Nitrate daily. Fifteen per cent. Protargol will do as well.

Where the mother must attend her own child, painting the eyes daily with 15 per cent. Protargol in the morning by the doctor or nurse, and two-hourly irrigation with lukewarm Boracic lotion, together with one drop of 5 per cent. Protargol in the evening, will bring about a thorough cure.

At hospital, therefore, the eyelids are painted for the first time with 2 per cent. Silver Nitrate. To the mother I give Boracic lotion and 5 per cent. Protargol drops. The mother is told to bathe away the discharge from the eyes as soon as any appears. If the disease is slow in abating, it is most probably due to the mother not cleansing the eye frequently enough, therefore the help of a nurse should be sought.

It is not possible to place every child in a hospital ward, nor, indeed, is it necessary if the case pursues its normal course. The most important part of the treatment is the constant irrigation with a warm weak lotion. A fact I have noticed is that the cure is much more rapid if $\frac{1}{2}$ per cent. Atropine drops are instilled twice daily in all cases of ophthalmia neonatorum.

Such a ward as the Ophthalmia Ward at the Women's Lock Hospital in London is exceedingly useful, as here both mother and child are received, each for appropriate treatment. Should any of my readers be associated with

such a ward in a hospital, may it be suggested that none but babies suffering from ophthalmia neonatorum are given beds in such a ward. The disease is exceedingly contagious. Where a baby's eyes can recover, those of an adult can only recover with the greatest difficulty.

During the course of treatment, should the slightest sign of corneal haziness be found, ½ per cent. Atropine drops should be put into the eyes. After a corneal ulcer gives way, the iris is usually found filling the perforation. Infection is thus kept without the eye, so that the same irrigation can still be used and, in some cases, a useful eye results. Unfortunately many eyes in adults show large anterior synechiæ together with dense corneal scars. They are the result of an attack of purulent conjunctivitis in infancy.

Acute Blennorrhœa of Adults

Having considered ophthalmia neonatorum or purulent conjunctivitis in infants, it naturally follows that we should at once consider gonorrhœal conjunctivitis in adults. Its synonym is acute blennorrhœa.

I have already said that even with the severest gonorrhœal infection a baby's eye can recover. It is with the utmost difficulty that an adult's eye can do so.

Fortunately acute blennorrhœa is comparatively rare. Both males and females suffer, and, in the majority of cases, it proves most intractable to any form of treatment.

The disease is usually unilateral, and in a right-handed person it is generally the right eye that suffers. The gonococcus is conveyed from the urethral discharge. There is much more swelling of the lids and conjunctiva than in children. The purulent discharge is copious, and there is a great tendency to involvement of the cornea.

It should be remembered that a very similar condition can be produced by the streptococcus, and that on no account should conjunctivitis in children or in adults be assumed to be due to the gonococcus without a microscopical examination. The gonococcus is a diplococcus which

stains very readily and is decolorised by Gram. When the large epithelium cells are examined under the microscope, these bun-shaped diplococci are easily found. The incubation period is brief, from a few hours to two or three days. The upper eyelid is often found overhanging the lower eyelid with copious purulent discharge appearing from between the lids.

Recently I saw a boy aged 7 and a younger child whose mother was suffering from a gonorrhœal discharge, and who through desertion of the husband had to go out and seek work. The children being left to fend for themselves, they used soiled linen with which to dry themselves. The boy of 7 acquired an acute blennorrhœa, while the younger sister acquired a vaginitis. The boy's eyes were bleeding freely from large swollen velvety conjunctivæ. Although his cornea perforated, we were able to save the eye, and later attempt to remove the dense iris adhesion which had formed.

But in the adult it is exceedingly common to see the whole surface of the cornea slough off. In fact the cornea seems to melt away, its place being taken by dense connective tissue in such a remarkable manner that both the lens and the vitreous are preserved, but, of course, sight is lost.

I have seen the conjunctiva slit in order to relieve the chemosis, but such treatment is wrong. What one has to aim at is the treatment of the conjunctiva, and the chemosis may be reduced by osmosis.

When the cornea is giving way, haziness or yellow spots or both are found to be present. The surface becomes ulcerated, and the ulceration may extend completely round the cornea, its progress being rapid. Further, on examination, the preauricular gland may be found swollen, and even suppurating.

The treatment differs greatly from that of ophthalmia neonatorum in children. As one eye alone is usually affected, the other eye should be rigorously protected by a Buller's shield, which consists of a watch-glass stuck in a frame of adhesive plaster and fastened to the face and nose. It should be left open at the lower outer angle in order to

ensure ventilation. A great many patients will not wear such a contrivance, so that all one can do is to warn them against infection being carried across from one eye to the other.

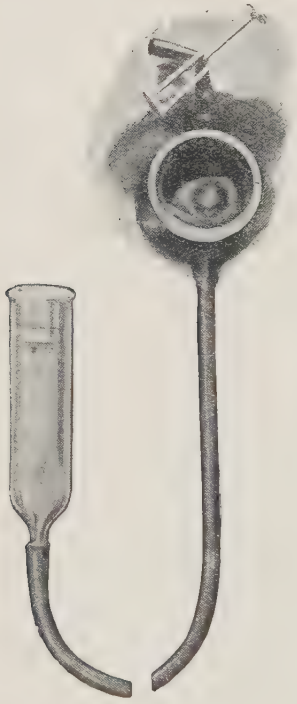

Fig. 7.—Batten's Hydrophthalmoscope.

The lotion filling the instrument is prevented from escaping by the rubber tube at top being compressed by a clip while the suckage which keeps the glass and cup before the eye is maintained by lowering the glass tube held in patient's hand.

On no account must Silver Nitrate be used. A cornea which may be just putting up a resistance will break down when such a caustic is applied. Therefore no matter how great the temptation, do not use Silver Nitrate.

Again, as in ophthalmia neonatorum, constant irrigation with a weak warm antiseptic lotion is required. The constitution of the patient suffers greatly, so that he should be kept in bed. Sometimes iced applications are required, although I believe hot fomentations do more good.

At the London Lock Hospital we use a 10 per cent. solution of Magnesium Sulphate. The osmotic action is produced by the use of Batten's hydrophthalmoscope (Fig. 7). The use of this instrument is easily learnt, so that the patient can hold it in his hand and not take up the time of the nurse or surgeon.

Many general practitioners will not undertake any work connected with eye diseases. If there is ready access to the ophthalmic surgeon, in such cases as we are now discussing, his help should be sought. But scattered throughout the world are men in lonely posts, such as in

various parts of India, where the medical man must rely on himself alone.

In India a great deal of gonorrhœal disease is found, and it is from one (Henry Kirkpatrick) who has worked with many cases of acute blennorrhœa that the author has learned to use the Magnesium Sulphate solution as described.

If the cornea is completely destroyed, the eye presents an exceedingly ugly appearance, so that many patients ask for its removal. This should not be done immediately. For weeks and months a thin discharge continues to flow from the eyelids. Most of this consists of mucus, but it is wise to wait until the eye is perfectly dry before removing it.

When such an eye has been removed, I substitute a glass globe within Tenon's capsule. The movements of the eye are therefore controlled by the extra ocular muscles which are sewn together over it. Movement is thus imparted to the artificial eye. This is similar to Adam Frost's operation.

In any form of gonorrhœal conjunctivitis the writer has never found vaccines to be of the slightest use.

Phlyctenular Conjunctivitis

We next turn to an exceedingly common condition found particularly in the poorer quarters of many large towns. Phlyctenular conjunctivitis is seen by every practitioner (see Plate I, Fig. 1). It is readily recognised by the fact that it occurs in children, many of whom look ill fed, mostly suffering from adenoids. The mother usually brings the child, leading it by the hand, as the eyes remain tightly closed, or at best the child looks up with difficulty.

If the child can look up, all that is found is a slightly reddened conjunctiva. Nearly always both eyes are affected, or one eye may be affected much more than the other. In acute cases, one or more small round grey or yellow nodules are seen situated on the conjunctiva just at the edge of the cornea. Occasionally these phlyctens,

as they are called, invade the edge of the cornea and produce a phlyctenular ulcer. From the fact that enlarged lymphatic glands and other signs of tubercle are present, such a disease has often been associated with tuberculosis. But if a bacteriological examination is made, tubercle bacillæ are not found, but many organisms of muco-purulent conjunctivitis are.

It is difficult to say whether the disease is a true infection or is the result of a toxæmia. When phlyctens are present and the conjunctiva is inflamed, there is strong photophobia accompanied by blepharospasm. The child hangs its head and will not look up at the light, and the attempt to open the eyelids is met with the greatest resistance.

In extreme cases phlyctens are found forming a complete ring round the cornea. Such a case suffers most from photophobia and blepharospasm. This must not make the doctor desist from examining the cornea. I admit it takes considerable practice to separate the lids of such a child with the tips of the forefingers without everting them, but it is only by this method that the cornea can be examined fully.

The treatment consists of bathing the eyes frequently with warm Boracic lotion, and in mild cases a little soft ointment consisting of Boracic Acid 10 per cent. and Yellow Oxide of Mercury 2 per cent. placed within the eyelids thrice daily.

When the phlyctens are close to the corneal edge and ulceration is threatening, then Atropine ointment $\frac{1}{2}$ per cent. is combined with the Yellow Oxide of Mercury and used thrice daily.

It is not necessary to bandage the eye. Smoked glasses or a shade may be used, but if there is corneal ulceration, then the eye should be bandaged.

If at all possible, in these severer cases the help of the oculist should be sought.

It might be questioned, if perforation has already taken place, what can be done for the eye ? I have published a method whereby grafting can save such eyes and enable

even full vision to be obtained. There is seldom any need to sacrifice an eye even if perforation has taken place.

If the doctor discovers the need for removing adenoids and tonsils, this should be done. A change to the country will enable a child to overcome chronic recurrent attacks. The work done at Swanley is the finest example of what can be accomplished for the children, many of whom are taken from the slums of London. Children who cannot go to the country are greatly benefited by phototherapy.

Angular Conjunctivitis

Let me conclude this chapter by a brief reference to what is known as angular conjunctivitis. A typical picture is that of an adult suffering from irritating inflammation of the eyelids. The conjunctiva may be slightly reddened, but at the inner and outer canthi, the conjunctiva and skin are sharply inflamed. When the upper eyelid is raised, the conjunctiva above the cornea will appear practically normal. The patient complains of discomfort with very slight discharge, accompanied by a considerable amount of blinking and itching at the inner canthi.

The disease is due to the Morax-Axenfeld diplobacillus. These are large thick rods in pairs placed end to end. They stain well and are decolorised by Gram. This form of conjunctivitis responds readily to the use of zinc salts. As the conjunctivitis may be somewhat mixed, I usually begin by painting the lids with 15 per cent. Protargol, but on successive days with Zinc Sulphate, $2\frac{1}{2}$ grs. to the oz. To the patient I give the following lotion: Boracic Acid, 16 grs.; Zinc Sulphate, 1 gr.; Aqua Rosæ, 1 oz. The patient bathes the eyes three or four times a day with this lotion diluted with an equal quantity of warm water. Such treatment produces a rapid result.

Follicular Conjunctivitis

This condition is characterised by the presence of oval or roundish transparent bodies on both upper and lower eyelids. They are more numerous in the lower fornix and

never on the bulbar conjunctiva. These follicles remain discrete and are extraordinarily difficult to diagnose from the follicles of trachoma. Follicular conjunctivitis is seen in young people who, as a rule, are far from being robust ; it is probably due to overcrowding but is not obviously contagious. Scarring is not produced by the disappearance of the follicles. The treatment for this condition is specially by the use of astringent lotions ; if a lid which is practically covered with these follicles is painted daily with Zinc Sulphate 2½ grs. to the oz., it is remarkable how quickly the condition clears up. Atropine acts as an irritant in this condition. When the lids are again normal, special attention should be given to the refraction.

Trachoma

Trachoma is rarely seen in England, it is commoner in Ireland : the writer has treated several cases among Irish domestics settled in England. It is also seen in certain parts of Russia, Egypt, and among other inhabitants of the East, but is not common among negroes. It has been said that Napoleon's soldiers returning from Egypt in 1798 introduced the disease into Europe. This however is open to question.

The follicles in trachoma are chiefly confined to the upper eyelid ; sometimes they are larger in size than those seen in follicular conjunctivitis. They are found along the upper margin of the upper tarsus. There is a considerable amount of irritation and photophobia with a certain amount of discharge from the lids. The chief complication of trachoma is what is known as pannus ; this is a lymphoid infiltration of the margin of the cornea. Blood-vessels spread superficially downwards and obscure the upper half of the cornea. In the final stages of trachoma the pannus has spread over the whole cornea so that vision is almost lost. The treatment of trachoma is generally based on the use of the copper stick. Silver Nitrate is often used, strong perchloride of Mercury lotion has been used, but it has not

been the writer's lot to see a single case cured by medical means.

As each case of trachoma has presented itself, the following operation has been done. The follicular-bearing area of the conjunctiva has been dissected away, sometimes including the tarsal plate of the upper eyelid. The bare area left is covered by pulling the conjunctiva down from the upper fornix, thus deformity of the eyelid is avoided. There is usually a profuse muco-purulent conjunctivitis following this operation, but the pannus disappears and the patient's vision rapidly improves. A patient from Baghdad, 17 years of age, who had never been able to use his eyes, had this operation done on both upper eyelids. The tarsal plates had to be dissected away with the conjunctiva, but the result was such that in a few months' time he was able to return to his own country with useful vision and the ability to use his eyes for work.

A brief contrast will help the reader to understand the resemblance of this disease to follicular conjunctivitis :

Follicular Conjunctivitis	Trachoma
1. Follicles small, rarely over 1 mm.	1. Follicles may be from 2 to 4 mm. in diameter, often resembling sago grains.
2. Do not leave scars on healing.	2. Scar tissue generally formed with deformation of the lid.
3. Pannus not present.	3. Pannus a complication.
4. The tarsus not involved.	4. Tarsus usually involved.
5. Occurs usually in young people in their teens and twenties.	5. Occurs at any age.
6. Not usually contagious.	6. Contagious.

If a case is seen which presents difficulty in the diagnosis, the lids should be painted daily with Zinc Sulphate, $2\frac{1}{2}$ grs. to the oz. This, at the end of one week, will decide the diagnosis, as the trachomatous follicles are not affected by such treatment.

All the tissues of the eye, including the conjunctiva, are liable to be attacked by syphilis, tubercle, etc., but the recognition of such does not come within the scope of this work.

CHAPTER IV

DISEASES OF THE CORNEA

To follow the pathology of the various diseases of the cornea it would be well to remember its microscopical anatomy. The cornea consists of the following layers from before backwards. A layer of stratified epithelium, which is nothing

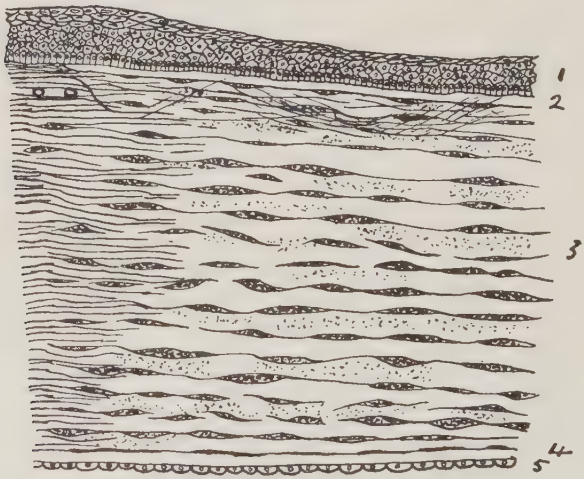

Fig. 8.—Microscopic Section of Cornea.

1. Epithelium on surface resting on
2. Bowman's membrane.
3. Substantia propria.
4. Descemet's membrane.
5. Endothelium.

else than the transformed conjunctiva passing over the front of the eye. It is this epithelium which is really the first line of defence of the eye, although the gonococcus and the diphtheria bacillus have the power to attack it in its normal condition.

This stratified epithelium rests upon a thin lamina of

homogeneous connective tissue, Bowman's membrane. The third layer is the substantia propria of the cornea continuous with the sclerotic. It is composed of bundles of white fibres arranged in regular lamellæ. Between these lamellæ lie connective tissue corpuscles. A section stained with gold chloride shows these connective tissue corpuscles and forms a very beautiful picture.

The fourth layer is the homogeneous elastic layer or Descemet's membrane, the posterior surface of which is covered by a layer of pavement epithelium. The nerves of the cornea pass in from the periphery, through the substantia propria, ending in fine tendrils between the epithelial cells on the surface. No wonder the patient complains of pain when a minute ulcer of the corneal epithelium is present.

There are no blood-vessels in the cornea, but when the cornea is attacked by disease blood-vessels grow in both from the conjunctival vessels on the surface and from the deeper choroidal vessels at the limbus.

Corneal Ulcer

Ulcers of the cornea are frequently seen in general practice. Very often there is a history of a small foreign body entering the eye. The patient rubs the eye with his knuckle, producing a small abrasion of the epithelium. If the foreign substance is infective not only a conjunctivitis may ensue but a corneal ulcer as well.

In poorly fed children, not only does the epithelium become infected, but corneal ulceration may extend so deep as to lead to early perforation.

The method of detecting the presence of a corneal ulcer is to insert two drops of 2 per cent. Cocaine followed by one drop of 1 per cent. Fluorescein. The conjunctival sac is then washed out, and if there is an ulcer present, its outline will show as a fine green fluorescence. The simplest method however, and one which is painless and does not require Cocaine, is to use 1 per cent. Bengal Red. If the ulcer has not penetrated Bowman's membrane, merely its edge will

stain green with Fluorescin. Indeed Bowman's membrane is a very tough structure. With the end of a fine orange stick the epithelium can be scraped off without wounding this membrane. If the ulcer does not extend through Bowman's membrane, when healing takes place, a scar will not be visible. But if the membrane has been destroyed, it will not regenerate, and as healing takes place by connective tissue, then a white scar of more or less density will form.

A patient with a corneal ulcer will complain of sharp pain with lacrimation and photophobia. The fine terminal nerves of the cornea are exposed, hence the acute pain.

There are many different forms of corneal ulcers. The commonest is the one just mentioned. It is a fine superficial ulcer, single or multiple, and is always associated with a certain degree of chronic conjunctivitis. It is the recognition of the latter that indicates the treatment.

A typical example is as follows: A ship's steward presented himself with one eye tied up. He complained of great pain and diminished vision. When the cornea was stained, there were no less than five small ulcers present. Someone to whom he had previously gone attempted to carbolise these ulcers but had omitted to evert the lids, and so did not treat the conjunctivitis. The procedure was reversed and the conjunctivitis treated, with the happy result that in a few weeks' time all trace of corneal ulceration had gone, and vision once more became normal. Remember then if a minute corneal ulcer is found, treat the conjunctivitis first. For treatment, paint the lids with Zinc, $2\frac{1}{2}$ grs. to the oz., and give the patient Lotio. A.B. c. Zn., together with a little Ung. Ac. Boracis 10 per cent., with the eye bandaged if there is no purulent discharge. If there is a purulent discharge, the eye must not be tied up.

If a simple ulcer erodes through Bowman's membrane, then it must be carbolised. This is done by placing a drop of 5 per cent. Cocaine into the conjunctival sac. The ulcer is dried by touching it with a fine piece of blotting-

paper, and by means of a pointed orange stick, a minute drop of pure Carbolic Acid is applied. The edges of the ulcer should be raised up with the stick so that the carbolisation may be complete.

When discussing phlyctenular conjunctivitis, it was pointed out that phlyctens were commonly found situated at the edge of the cornea, and as the epithelium of the cornea is but part of the conjunctiva, this may become affected, and a corneal phlycten ensue. Destruction of the epithelium takes place, and sometimes a fresh infection will start corneal ulceration. The corneal phlycten is a grey nodule, becoming yellow when broken down. It may rapidly erode and perforate the cornea, although this is not common ; or it may extend across the cornea carrying a leash of vessels with it ; these lie in a shallow gutter and follow the advance of the ulcer. This type of ulcer does not go deep but remains superficial.

Should the cornea perforate, it is not necessary to imagine that the eye is lost. It is just such a type for which the result of grafting is seen at its best. Some of the cases done show little or no trace of where perforation has occurred.

The nature of such ulceration is indicated by the state of the conjunctiva. Phlyctenular conjunctivitis, particularly when phlyctens are present at the limbus of the cornea, is readily diagnosed. The ulcer should be carbolised and treatment with simple Boracic lotion, also Ung. Atropine 1 per cent., c. Hydrarg. Ox. Flav. 2 per cent., should be given. Remember, in the case of a simple corneal ulcer which is not due to phlyctenular conjunctivitis, Hydrarg. Ox. Flav. should not be used.

Marginal Ulcer

Another type of corneal ulceration is known as the marginal ulcer. This is shallow, often multiple. The most serious forms occur in old people, and sometimes lead to necrosis of the whole cornea. Such ulcers, if due to the Morax-Axenfeld Diplobacillus, should be treated with zinc salts. But sometimes one is really defeated by such ulcers

in old people with very enfeebled health. The ulceration will extend across the cornea and so sight is practically lost. Sunlight treatment to the body generally will help these conditions, but must not be applied directly to the eye itself.

Neuro-Paralytic Keratitis

Another form of ulceration is known as neuro-paralytic keratitis. This occurs in cases where the 5th nerve is paralysed. It is seen where this nerve has been injected with alcohol for trigeminal neuralgia without proper precautions for the protection of the eye having been taken. There is a doubt as to the actual cause. On the one hand, after alcoholic injection, trophic impulses conducted by the nerve are absent. On the other hand, the cornea is insensitive, so that foreign bodies entering the eye are not felt, nor are slight abrasions noticed.

The ulcer in this case is treated by gentle carbolisation together with a mixture of Ung. Atropine 1 per cent. and Boracic Acid 10 per cent. The lids need not be sewn together as is so often advocated, but the eye must be kept closed by a bandage. It will be months before the eye can be left uncovered. It must not be uncovered too soon.

Herpes Ophthalmicus

Closely associated with the above ulcer is the one associated with herpes ophthalmicus. A recent case was that of a man who presented himself at hospital. He said that owing to the severe pain in the eye, in order to gain relief, he had applied hot fomentations which had blistered the skin of the forehead above the eye. He would not believe the statement that the blisters above the eye, and which extended into the hair of the scalp, really constituted the evidence of the disease, and that the condition of the eye was part of the same.

When herpes ophthalmicus occurs, vesicles are seen following the course of the supra-orbital nerve. The eruption is generally preceded by a neuralgic pain along the course

of the nerve. Sometimes fine corneal vesicles are found. A diffuse deep infiltration of the cornea associated with an iritis is commoner ; most text-books state that it is an irido-cyclitis, but in those the writer has seen and treated he has never found vitreous opacities. The cornea is insensitive and so can be touched by a fine wisp of cotton-wool. Peculiarly enough, there is sometimes a history of contact with patients suffering from chicken-pox.

The treatment of this condition consists mainly in protection by a bandage. Atropine ointment and warmth are used, and the general health attended to, while the skin may be treated with Cocaine ointment 1 per cent. and dusted with starch powder. During the acute stage, the patient should be kept in bed, while opium and quinine should be given internally.

Hypopyon Ulcer

One other form of ulceration of the cornea seen in general practice is the hypopyon ulcer (see Plate I, Fig. 3). This is nothing else than a pneumococcal ulcer. The infection is likely to take place if there is any inflammation of the lacrimal sac (dacryocystitis). The presence therefore of dacryocystitis is a real menace to the eye. If the cornea is injured by abrasion, say with the finger-nail or the branch of a tree, etc., infection by the pneumococcus may take place. Hypopyon ulcers also follow measles, scarlet fever, smallpox, etc. This ulcer has also been called Ulcus Serpens.

It shows as a yellowish disc near the centre of the cornea. There is a little grey infiltration in the healthy cornea around. There is a violent iritis, and at the bottom of the anterior chamber a yellow deposit is seen. It forms a horizontal line. If the patient lies on his side, the hypopyon will move to the lowest part. It may be so extensive as to fill completely the anterior chamber. It consists of polymorphonuclear leucocytes massed together in the lower angle. These are derived from the iris and ciliary processes. The deposit is sterile.

If the ulcer is left to pursue its natural course it will perforate, usually forming a large opening through which the iris prolapses. Rarely panophthalmitis or suppuration of the eye follows. The majority of cases should be admitted at once to hospital for treatment. They yield to skilled treatment and often a useful eye is saved, but if left to the patient's own care, the eye is often lost. Cauterisation by means of pure carbolic or by the galvano cautery is used, and it is in this type of ulcer that Saemisch's section is employed. With a fine, narrow Graefe knife, after cocainising the eye, insert the point in the healthy cornea just outside the edge of the ulcer. The ulcer is divided straight across. The aqueous pours out and with it much of the hypopyon. Atropine is instilled and a bandage applied. This procedure improves the nutrition of the cornea and evacuates the hypopyon, but it must not be tried in mild cases or the early stage of severer cases.

A great many oculists use a quinine derivative called optochine. A 1 per cent. solution is supposed to have a specific action on the pneumococcus.

The results of treating a hypopyon ulcer vary greatly, but often in elderly people, where atropine cannot be employed for fear of glaucoma, the result of the ulcer is extensive and the sight is greatly diminished. If tension is already raised, then trephining is indicated, usually with good results.

Interstitial Keratitis

The disease known as interstitial keratitis is one of great importance not alone to the ophthalmologist, but to the general practitioner as well. The recognition of this disease in the majority of cases is comparatively easy, and the appropriate treatment is exceedingly satisfactory.

If the various text-books on ophthalmology were consulted, opinions therein would be found far from unanimous in their methods of treating such a condition. The writer some years ago undertook a special study of this disease (see *Preliminary Report on the Treatment of Interstitial*

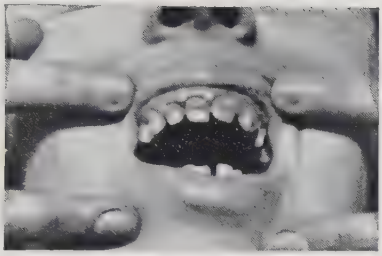

Fig. 9.

Fig. 10.

Two Types of Teeth seen in Congenitally Syphilitic Children.

(Fig. 9.) Peg teeth widely separated from each other.
(Fig. 10.) Notched teeth (Hutchinsonian) from the girl shown in Fig. 12.

Fig. 11.—Mother.

Fig. 12.—Daughter.

Note the remarkable contrast of profile. The destruction of the girl's ethmoidal region included the lacrimal bones, so that the lacrimal canals were impermeable and functionless.

Keratitis, 1925). Jonathan Hutchinson in 1858 began a series of papers on the subject of inherited syphilis in its relation to diseases of the eye. The number of cases investigated by him was ninety-eight, and from his study he was able to show the superior efficacy of specific treatment by mercury and iodides.

Many workers have appeared in this field. Nettleship, Sinclair, Bishop Harman, Langendorff, and others. It was with pleasure I read of Langendorff's work at the Rudolf Virchow Hospital, which led him to the conclusion that specific treatment is undoubtedly beneficial although its action is not dramatic. He said : " The most reliable test of the severity of a disease of the eye is to note the degree of vision left after the culmination of the disease, and judged by this test, the value of consistent specific treatment stands out plainly."

Observations have led the writer to the same conclusion regarding the end results of specific treatment. He has endeavoured to give these in terms of the vision finally obtained, and in this respect differs from the majority of workers on this subject. The eye is an optical organ and its function is that of vision. Surely, then, the most important consideration is the degree of vision left in an eye that has been attacked by any form of disease. Judged by this test, the best treatment is the one which gives the highest vision at the termination of the disease.

The writer collected a series of ninety-one cases which extended over a period of four years. He found the proportion of males to females was 1 : 1·87, while Hutchinson obtained the figures 1 : 1·7. The youngest patient was 5 years of age, and the oldest 49, but only two cases were over 26 years of age. The majority occurred between 6 and 12 years of age.

The doctor should make himself familiar with the signs of congenital syphilis. For example, the permanent incisor teeth show notching, or instead of notching, may appear peg-shaped with spaces between the teeth (Figs. 9 and 10). Usually the bridge of the nose is acutely depressed (Figs. 11

and 12). Deafness was not present in any case when the interstitial keratitis was first seen. Remember, however, deafness is common in those who have not had prompt and thorough treatment.

It may be mentioned here that the writer has never seen the slightest improvement in the hearing of any congenital syphilitic from any form of treatment once the deafness was established, and this agrees with those authorities on diseases of the ear who have stated that treatment avails little or nothing in cases where deafness is due to congenital syphilis.

The pathological state of the labyrinth makes it quite clear why this is so. Hutchinson and Jackson said 10 per cent. of congenital syphilitics acquired labyrinthine deafness, and it may supervene just as the attack of interstitial keratitis is passing off. How important then becomes the prompt and thorough treatment of interstitial keratitis. The deafness alone would indicate that the treatment must be constitutional as the disease is constitutional, although only the eyes may appear to suffer from the ravages of congenital syphilis.

One important fact is brought to light by questioning the mother about the births in her family. Several times it has been told that previous to the birth of the child, now the patient, a miscarriage had taken place. All the children born before the miscarriage were perfectly healthy, while those that came after suffered in a greater or lesser degree from some form of congenital syphilis. Obviously the miscarriage gave an indication of the time when the mother became infected.

It is also while questioning the mother that one realises to some extent the awful wastage of human life caused by women contracting syphilis. Recently one woman said she had had four miscarriages every year for the past four years. The child she brought was suffering from the onset of interstitial keratitis and had other signs of congenital syphilis about the body.

Interstitial keratitis is not the last manifestation of con-

genital syphilis. The writer has seen a gumma in an eye long after the onset of the interstitial keratitis; also gummatous ulcers on a girl's leg when the infected eyes were quite healed. At the West End Hospital for Nervous Diseases a young man, aged 23 years, who had suffered when a child from interstitial keratitis, now presented himself, showing symptoms of general paralysis of the insane.

One should examine the knees of these young people. They are often attacked and show the typical bilateral sero-synovitis termed Clutton's joints by d'Arcy Power.

The investigation into the ætiology was as follows. Sixty-four new cases seen for the first time all showed a positive Wassermann reaction of the blood serum. Eight cases were old, the disease having run its course more than ten years previously. In all of these which had not specific treatment, the Wassermann reaction was negative, but in five of these where an examination of the cerebro-spinal fluid was done, a luetic curve was obtained by means of Lange's colloid gold test, proving definitely they were syphilitic. Therefore one must not infer from a negative Wassermann reaction of the blood that a condition is not syphilitic. It was due to this misunderstanding that many cases of interstitial keratitis were supposed to be tuberculous. In this series, 100 per cent. were syphilitic.

It is wise for practitioners to remember in congenital syphilis when the Wassermann reaction is positive, treatment does not change it to negative, and in old cases of interstitial keratitis, when a fresh manifestation of syphilis makes itself evident, the Wassermann reaction of the blood serum may or may not be found positive. In acquired syphilis, therefore, the Wassermann reaction can indicate the result of treatment, but in congenital cases, it is the clinical manifestations which must be observed as the measure of thorough treatment.

The onset of interstitial keratitis varies greatly. There may be merely fine opacities in the cornea with very little vascular manifestation around the limbus. With the corneal microscope, minute spots not visible to the naked

eye are seen scattered throughout the cornea. In two or three weeks' time the eye becomes much more acutely affected, so that the redness of the pericorneal zone deepens while photophobia becomes more marked. Many cases show a red patch at the edge of the cornea accompanied by photophobia. If it is looked at through a magnifying glass, this salmon patch is found to be composed of numerous vessels both superficial and deep. Actual ulceration is exceedingly rare (see Plate II, Fig. 2).

As the opacities of the cornea increase, minute blood-vessels may be seen passing in from the limbus. They are both superficial and deep, and although these vessels may disappear when the attack has passed off, they can be seen with the microscope years later as fine dark lines.

There is one type of onset of the disease where the cornea becomes entirely opaque. The pupil cannot be seen at all. These are termed fulminating cases (see Plate II, Fig. 2).

In the microscopic section of a cornea suffering from interstitial keratitis, the following is seen. The epithelium on the surface is swollen and shows minute vesicles or bullæ. The body of the cornea is infiltrated with large masses of leucocytes. Large blood-vessels accompanied by nerves are seen invading the cornea proper. Descemet's membrane is wrinkled or folded on itself, while the endothelium shows pittings. There is a certain amount of iritis. This should always be borne in mind, as it is absolutely necessary to prevent adhesions or posterior synechiæ being formed. This can only be done by the use of atropine from the very onset of the disease.

Although a child may be attending hospital, the family doctor is often questioned by the mother as to the cause of the disease, and its duration, also what the outlook may be. Wherever possible ascertain the Wassermann reaction of the parents' blood, and treat them accordingly.

The course of the disease varies somewhat, but on an average, from the time of the onset of the keratitis to its termination, is from 6 to 8 months, and occasionally (3 per cent.) there is a recurrence.

INTERSTITIAL KERATITIS.

A

Mild onset without pericorneal injection. Faint corneal opacities present.

B

"Salmon Patch," with pericorneal injection.

C

"Fulminating." Eye greatly injected. Neither iris nor pupil seen. Cornea deeply vascularised.

[*R. Lindsay Rea.*

The parent of the child should be warned that the disease is liable to attack both eyes. This is the rule in congenital syphilis, but is not the case in acquired syphilis.

The prospect is good if treatment is begun early and vigorously. One case, in which a recurrence took place, the entire treatment lasted over two years. The patient now has 6/6 vision in each eye.

As to treatment, from what I have already said, it is clear that it must follow definite lines. Firstly, Atropine ointment 1 per cent. must be applied thrice daily to prevent adhesions forming in the pupillary margin of the iris. If the symptoms are mild and with little photophobia, it is a decided advantage to add Hydrarg. Ox. Flav. 2 per cent., but if the attack is severe, then it is better to use Atropine alone. Observation with a slit lamp and corneal microscope shows that in those cases with severe photophobia, the superficial structures are heavily involved. The epithelium is œdematous or even bullous, there are numerous conjunctival vessels present, and in such a condition Hydrarg. Ox. Flav. can only act as an irritant.

The treatment should be constitutional, and as one proof of this, not one of the sixty-four new cases which have been treated from the onset has developed deafness. In untreated interstitial keratitis deafness is common. Again, choroiditis is singularly absent in those cases which have been treated constitutionally from the beginning, whereas it is the rule in untreated cases.

The treatment therefore is as follows. In addition to the treatment by Atropine some form of arsenical injection given intravenously each week is employed. I have come to the conclusion that Novarsenobillon (N.A.B.) is undoubtedly the best. If the child is young or the veins are difficult to find, then Sulfarsenol can be given intramuscularly. The first injection of N.A.B. should be ·12 grm. This is increased to ·3 grm. in two to three weeks' time. If the child is over 12 years of age the dose can be increased to ·45 grm., but for 10 to 12 years of age the amount which seems to act most effectively is from ·25 to ·3 grm.

It is well to remember that in children, as in adults, two smaller doses given within a week's interval are infinitely better than one dose of twice the amount given singly. Ten to twelve injections should be given with a week's interval between. Also give Hydrarg. c. Creta, 1 to 3 grs. daily. Treatment should be as thorough as possible. Even if the keratitis be of a mild character, eight, ten, or twelve injections should be given, followed by mercury. Iodides should be included if the patients are of adolescent or older age, and treatment should continue for one year at least.

The writer now uses in addition an inunction of Suspensol Bismuth Cream.

If the keratitis should prove obdurate, or should a recurrence take place, then a series of injections of N.A.B. should be repeated, and one should be prepared to continue treatment for another year.

When the eye becomes quite white, Atropine should be stopped, but the use of Ung. Hydrarg. Ox. Flav. 2 per cent. should be continued nightly so as to obtain the minimum amount of scarring of the cornea. As a tonic Syrup Ferri Iod. is useful also for children.

A glance at the three tables at the end of *The Treatment of Interstitial Keratitis* should convince the most sceptical of the value of the treatment outlined.

CHAPTER V

DISEASES OF THE SCLERA

The sclera and cornea form the fibrous tunic of the bulb of the eye, the sclera being opaque but not so opaque as to prevent the interior of the eye being illuminated from without. In this way neoplasms such as sarcoma of the choroid are detected by means of transillumination. The cornea is, of course, transparent and forms the anterior sixth, while the sclera constitutes the posterior five-sixths of the fibrous tunic of the eye.

The sclera, as its name denotes, is extremely dense, its hardness serving to maintain the form of the bulb. It is much thicker behind than in front. The posterior part is 1 mm. thick. Its surface is white and smooth except at the insertion of the muscles, the recti and obliqui. Behind, it is pierced by the optic nerve, and it is of importance to remember that the sclera is continuous through the fibrous sheath of the optic nerve with the dura mater.

Where the optic nerve pierces the sclera, the structure of the latter is represented by a thin cribriform lamina, the lamina cribrosa. It is through the minute orifices of the lamina cribrosa that the nerve filaments pass. Also a larger opening in the lamina transmits the central artery and vein of the retina.

When the optic disc is examined by the ophthalmoscope, the edge of the optic nerve is clearly defined, and frequently the central artery is seen issuing from the depth of the physiological cup. If the bottom of the cup is carefully focused, the transverse fibres of the lamina cribrosa are clearly seen. Immediately outside the entrance of the optic nerve are small apertures in the sclera for the trans-

mission of the ciliary vessels and nerves, while midway between the entrance of the optic nerve into the eyeball and the corneo-scleral junction, that is, at the equator of the eyeball, are four or five large apertures for the transmission of veins (*Venæ vorticosæ*).

In front the sclera is directly continuous with the cornea, the corneo-scleral junction, or the limbus. In the substance of the sclera close to the corneo-scleral junction is a circular canal (canal of Schlemm). This sinus communicates internally with the anterior chamber of the eye, and externally with the anterior ciliary veins. There are some elastic fibres scattered throughout the white fibrous tissue constituting the sclera, the fibrous tissue being aggregated into bundles arranged in longitudinal direction.

The above anatomy is not described for this brief chapter alone, but for the better understanding of some of the chapters yet to follow (see Fig. 13).

Redness of the eye is produced in many ways. As the conjunctiva covers the sclera in front, an inflammation of this membrane will produce a red eye, but if the eyelid is gently pressed with the finger against the conjunctiva, the vessels in the latter will be easily emptied showing a white patch where pressure has taken place. If the sclera is inflamed, pressure of any kind will not empty the vessels and a white patch cannot be obtained. Indeed, in a scleritis, few patients will allow pressure to be made on the eyeball.

Episcleritis

It is usual to describe the inflammation of the superficial fibres of the sclera and the deeper layers of the conjunctiva together as an episcleritis. Some text-books do not divide episcleritis, although many who have read Swanzy's *Diseases of the Eye* will remember that there episcleritis is divided into (1) periodic transient episcleritis of Fuchs, or the hot eye of Hutchinson, and (2) episcleritis of the usual type.

Sometimes it is very difficult to draw a dividing line

between the two. Episcleritis is characterised by frequently recurring attacks of inflammation of the episcleral connective tissue. The vascular injection is of a violet hue and

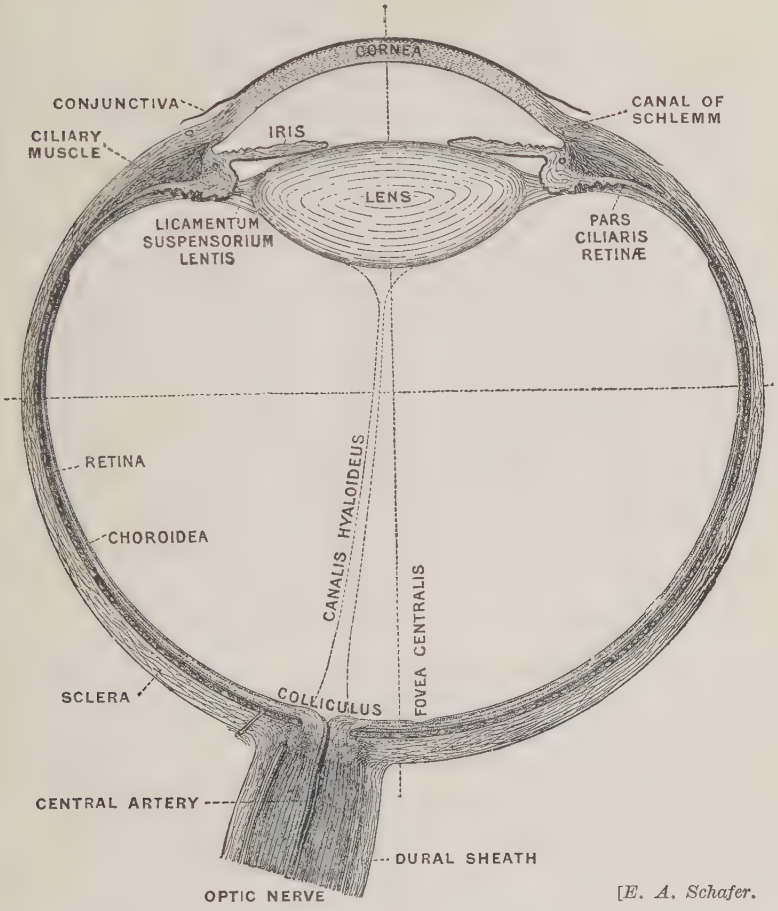

Fig. 13.—Diagram of Human Eye.

is commonly confined to one quadrant of the eye, and gradually wanders from one place to another. The pain varies greatly and there is some lacrimation and photophobia. It is a disease of adult life. It is this type which is known as the hot eye of Hutchinson. Episcleritis of

the usual type may appear 2 or 3 mm. from the corneal margin. There may be very little pain, but in a severe case, if there is a decided node at the affected place, the pain is pronounced. The duration of this type is usually long, whereas the periodic type may recur once or twice a year, lasting from several days to several weeks.

The causes of both are practically the same—rheumatism, where such a condition may express the toxic effect of a septic focus, such as infected roots of the teeth and the alveolar process surrounding the roots of the teeth. Sometimes it is impossible to find a septic focus, but the response to salicylate treatment commonly shows the origin of the disease. Again, the disease may be caused by tubercle or syphilis and possibly also by the gonococcus toxæmia.

In the rheumatic variety patients will often bitterly complain of pain. In a recent case, the whole of the episcleral tissue surrounding the limbus of the cornea was swollen and overhanging the cornea. It occurred in a patient a martyr to rheumatism and did not yield to anything less than 30 grs. Sod. Salicylate t.i.d., together with hot fomentations, Atropine, and rest in bed. The Atropine is of use, for the disease may spread to the iris, and posterior synechia must be avoided at all costs.

In syphilitic disease specific treatment must be given. A young man who had formerly suffered from interstitial keratitis, but had not received adequate treatment at the time, developed a chronic episcleritis which would only yield to mercury inunctions together with Mist. Pot. Iod. 10 grs. t.i.d.

Scleritis

In scleritis (deep scleritis) the whole of that part of the sclerotic which is in front of the equator is more likely to be affected than in the milder forms. Sometimes there are nodules, or a single nodule. The swelling is at first dark red or bluish, but later it becomes a paler blue. If it extends completely round the cornea, the condition is that of annular scleritis. Scleritis is a much more serious disease

than episcleritis in that the cornea and uvea are usually involved. There may be a cyclitis with "K.P." on the back of the cornea, or there may be an anterior choroiditis, and floating opacities may be found in the vitreous. The end result, due to absorption of the sclera, may be a ciliary staphyloma, the term applied to bulging of the sclera in this region.

Both eyes are usually involved, and in contradistinction to episcleritis, young adults are most chiefly affected. It attacks females more often than males. A somewhat usual result is to see the sclerosing opacities gradually spreading across the cornea. When these opacities are examined through the corneal microscope, deep blood-vessels are seen extending from engorged scleral vessels, but superficial vessels also take part in the process so that the whole depth of the cornea is affected.

As the disease occurs more commonly in females than in males, it is but natural that one should give attention to the state of the pelvic organs; there a cause may be found. On the other hand, syphilis, congenital or acquired, rheumatism, gout, or tubercle may be responsible.

If no direct cause can be found, the nasal sinuses should be searched for a possible septic focus.

The worst result that can possibly happen in this disease is unsightly bulging around the cornea known as ciliary staphyloma. Vision is impaired not alone by this deformity of the globe but by the effects of the uveitis, and secondary glaucoma may completely destroy the eyesight.

The treatment for scleritis is the same as for episcleritis. Atropine must never be omitted, and in the case of tubercle, injections of tuberculin will be found of great use.

Gumma

Closely associated with scleritis is gumma of the sclera. It may take the form of a single nodule or of several nodules situated near the limbus, or they may completely surround the cornea. Specific treatment by some form of arsenical

preparation such as Novarsenobillon given intravenously, combined with mercury and iodides, will effectively arrest the progress and save the eye and the sight.

Tubercle

Also there may be a single nodule or tubercle of the sclera. It may require excision or scraping.

Blue Sclerotics

Blue sclerotics are seen in babies, but a more pronounced blue coloration is sometimes seen in several members of the same family. It is hereditary and persists throughout life, and it is curious that such patients often suffer from fragility of the bones of the skeleton.

Wounds of Sclera

Lastly it may be mentioned that a clean-cut perforating wound of the sclera will heal, especially if the conjunctiva is neatly brought across the wound, without pressure on the globe.

CHAPTER VI

DISEASES OF THE IRIS AND CILIARY BODY

The iris is the contractile and coloured membrane which is seen through the transparent cornea and gives the colour to the eye. In its centre is an aperture, the pupil (see Fig. 13, page 43). Peripherally, it is continuous with the choroid and also, by means of the ligamentum pectinatum, with the cornea.

The anterior surface, when looked at through a magnifying glass, consists of fibres of trabeculæ running mainly towards the pupil. When greatly magnified with the corneal microscope, there are large cavernous spaces formed by these trabeculæ. In dark brown eyes these spaces are filled with brown pigment.

The framework or stroma of the iris consists of delicate connective tissue containing numerous blood-vessels and nerves. The endothelium layer on the back of the cornea is continued over the front of the iris. The posterior surface of the iris is covered by two layers of pigment epithelium. This pigment epithelium is continuous with the pigmentary layer covering the ciliary processes.

The colour of the iris depends partly on the colour of this layer, entirely so in infants, but in black, brown, and grey eyes the colour is due to and affected by the pigment cells scattered through the substance of the stroma itself.

The muscular tissue of the iris forms a ring (sphincter pupillæ) around the pupil, but it is also disposed as rays from the sphincter to the circumference (dilatator pupillæ). The sphincter is much more apparent than the dilatator in a microscopic section.

The long ciliary arteries, two in number, which pierce

the sclera behind near the optic nerve, and gain the interval between the sclera and choroid, pass forwards to the ciliary muscle.

Just behind the attached margin of the iris, each vessel divides into an upper and a lower branch, and these, anastomosing with the corresponding vessels in the opposite side and with the anterior ciliary arteries which pierce the sclera in front close to the insertion of the recti muscle, form a vascular ring, the circulus major. The smaller circle formed from the most internal of these branches forms the circulus minor around the pupil.

The vessels pursue a somewhat tortuous course, so that the blood-stream is not affected by the contractions of the sphincter and dilatator pupillæ.

In the fœtus the pupil is closed by a thin transparent vascular membrane, the vessels in which are continuous with those of the iris and the capsule of the lens, which is also vascular. About the seventh or eighth month of fœtal life this membrane becomes obliterated from the centre, but a few shreds may still remain and persist throughout life.

The sphincter pupillæ is innervated by the third cranial nerve, while the dilatator pupillæ is innervated by means of sympathetic fibres passing from the ciliary ganglion which lies behind the eyeball. These fibres have been derived from the superior cervical ganglion, which has received its fibres from the lower cervical portion of the spinal cord.

The iris is exceedingly sensitive, and when caught by iris forceps produces sharp pain. This pain can be abolished by the injection of Novocaine around the optic nerve and ciliary nerves at the back of the eye inside Tenons capsule.

Iritis

Iritis, or inflammation of the iris, is fundamentally the same process as occurs in other connective tissues (see Plate I, Fig. 5). The vessels become dilated. The capillary walls are damaged. Exudation of a highly albuminous lymph into the spaces between the tissues and a migration of leuco or lymphocytes take place, hence the normal move-

ments of the iris are greatly hindered. Also, due both to nerve endings being stimulated and to engorgement of the vessels, the pupil tends to contract.

It is worth reading this last paragraph over again, and then to consider the chief signs of iritis. The constricted pupil with an irregular pupillary margin reacts sluggishly. The delicate iris appears blurred and indistinct. This is sometimes known as "muddy iris." There is a change in colour so that a blue iris becomes yellowish green. Compare the affected side with the normal. The swollen vessels of the iris cannot as a rule be seen with the naked eye, but the inflammation is manifested by a ciliary congestion around the limbus of the cornea (see Plate I, Fig. 5). Around the limbus the engorged vessels cannot be emptied by pressure as can the conjunctival vessels. The albuminous exudate, having escaped into the anterior chamber, the aqueous becomes cloudy, interfering with a clear view of the iris. Later, when we compare the signs of glaucoma, all the above facts should be borne in mind.

Hypopyon, or a deposit lying in the anterior chamber, is sometimes found in severe cases of iritis. As the pupillary margin of the iris rests against the anterior capsule of the lens, the exudate, which is sticky in character, may form adhesions, and if the whole of the edge of the iris is glued down to the anterior capsule of the lens, the aqueous cannot escape from behind the iris through its usual channel, the pupil, into the anterior chamber. Hence the iris is bulged forward (iris bombé), and the tension of the eye will rise. The adhesions which form between the iris and the capsule of the lens finally become converted into firm fibrous bands which atropine cannot rupture.

When one wishes to confirm the diagnosis of iritis, a drop of Homatropine is instilled into the conjunctival sac, and in a short time the irregular shape of the pupil is seen. Long pigmented adhesions are found stretching between the iris and the anterior capsule. Sometimes in twenty-four hours, a complete ring of fine adhesions (posterior synechiæ) will be found, and when the iris is forcibly dilated

by Atropine, the shape and size of the pupil will be left as a pigmented circle upon the anterior capsule of the lens. If the adhesions have thus been early broken down, most of this pigment will become absorbed. One has often seen, through the neglect of not instilling atropine immediately at the onset of the disease, the pupil entirely filled with an exudative membrane (occlusio pupillæ). So deceiving may this membrane appear that I have known a famous physician diagnose it as cataract, with the unhappy result that, following iris bombé, secondary glaucoma set in, so that not only was the sight lost but, owing to the pain, the eyeball had to be removed.

Practitioners seem to find it difficult to distinguish between conjunctivitis, iritis, and acute glaucoma. It is not such a serious thing to mistake conjunctivitis for iritis. The presence of Atropine in conjunctivitis, although unnecessary, will not do harm, but if the Atropine were instilled when acute glaucoma is present, then a catastrophe may quickly ensue through the rapid rise of tension. One wishes to dilate the pupil with Atropine in iritis, but that is the worst possible treatment for glaucoma. In glaucoma one strives to reduce the size of the pupil.

It has just been said that the congested iris tends to contract the pupil, whereas in glaucoma the pupil is usually enlarged slightly and somewhat oval, with its long axis vertical. In iritis it is the common rule for the tension to be lowered, whereas in glaucoma, when the eyeball is gently pressed upon by the finger-tips, the tension is found to be raised.

The diagnosis between the two latter conditions is often extremely difficult, and here may I say that the practitioner should not take the responsibility of making a diagnosis if the services of an ophthalmic surgeon are available. How difficult it is to explain to a patient that if he had been seen before vision was destroyed, the eye together with its vision might have been saved. The practitioner gains more kudos by recognising that both iritis and glaucoma are severe and destructive diseases. The writer has seen the sight completely destroyed both by iritis and by glaucoma.

Atropine had been omitted in the case of iritis and had been given in the case of glaucoma.

The redness of the eye is more uneven in glaucoma than in iritis. In the latter there is a bright purplish-pink zone around the corneo-scleral margin.

Perhaps it would be well to enumerate the chief symptoms and signs of iritis. Pain of a neuralgic character referred not only to the eyes but also to the supraorbital region, and diminished vision due to cloudiness of the aqueous and exudates in the pupillary area. If a mydriatic has not been instilled, the pupil is somewhat contracted and slightly irregular. The iris has a muddy appearance, while there is ciliary congestion around the limbus. If a drop of 2 per cent. Homatropine is instilled the iris dilates with an irregular pupillary margin. One can quickly neutralise Homatropine with Eserine, but this cannot be done when Atropine has been instilled.

The commonest cases seen by an ophthalmic surgeon are simple cases of toxic iritis. Pain is a marked feature, but the exudates are not of marked amount, although given time eyesight can be greatly diminished through lack of the use of Atropine. In young people one associates the condition of the naso-pharynx as a cause. In adults teeth may be at fault, while in women, particularly young women, the disease may be associated with a pathological condition of the pelvic organs.

If one divides the various types of iritis as primary and secondary, then we may as well adopt the classification of Fuchs :

A. Primary Iritis.

- Iritis in consequence of general diseases.
  1. Iritis syphiliticus.
  2. Iritis gonorrhoica and focal iritis.
  3. Iritis in acute infectious diseases (iritis metastatica.)
  4. Iritis in disorders of metabolism.
  5. Iritis tuberculosa.
- Iritis as a local affection.
  1. Iritis traumatica.
  2. Iritis sympathica.

B. Secondary Iritis.

We will dismiss secondary iritis by merely mentioning that it develops through transference of inflammation, say of the cornea or sclerotic.

Briefly taking each of the primary forms in turn :

Syphilitic Iritis

Syphilis is a common cause of iritis, and for the most part it is acquired syphilis that we have to deal with. If yellowish red nodules of the size of a pin's head are seen on the iris, the diagnosis of syphilitic iritis is not difficult. The nodules are usually situated at the pupillary border of the iris or may be found on the ciliary border. Syphilitic iritis generally belongs to the secondary stage of syphilis, sometimes as early as the third month after infection. Usually, however, it is within the first year it is seen. The nodules, therefore, are not gummata, and they never break down nor suppurate.

Iritis also occurs in congenital syphilis. It has been seen in cases which had suffered from interstitial keratitis twenty years previously. Such cases, needless to say, had not received specific treatment. Sometimes in these congenital cases there may be a severe iritis associated with keratitis, but there is always some degree of iritis. Hence the necessity, as has been said in a previous chapter on interstitial keratitis, for Atropine.

Focal iritis is generally associated with septic pockets at the roots of dead teeth, etc.

Gonorrhœal Iritis

Possibly one of the commonest causes of iritis is the gonococcus. It often occurs years after the infection. One case recently where gonorrhœal iritis was diagnosed infection had taken place 19 years previously. By the rectal massage of the prostate, the gonococcus was found and recognised on the microscopic slide. The exudate of gonorrhœal iritis is not so plastic as that of syphilis, but it has a peculiar gelatinous appearance. It can become completely

absorbed, although it may appear at first to fill the anterior chamber.

Metastatic Iritis

A recent case will illustrate this. An elderly gentleman who had just passed the crisis of pneumonia was found to be suffering from pain and diminished vision in one eye. This was a true pneumococcal iritis, and is a peculiarly destructive form of this disease.

Metabolic Iritis

Metabolic iritis is seen in intestinal autotoxæmia, gout, arthritis deformans, sometimes in cases of diabetes.

Tuberculous Iritis

Young people may suffer from a tuberculous form of iritis. They are pathologically of the type known as scrofulous. The deposits are large and lardacious looking.

Traumatic Iritis

Traumatic iritis is caused in many ways. Perforation of the eye by a foreign body, operation such as cataract extraction, blows on the eye, and dislocation of the lens.

Sympathetic Iritis

Finally, when an eye is affected with irido-cyclitis in consequence of an injury symptoms of irritation or inflammation may develop in the other eye. It is unnecessary to go further into this condition. It is one for which the general practitioner should never on any account make himself responsible. The possibility of complete blindness is one of the most serious calamities the ophthalmic surgeon has to face. The responsibility of such a catastrophe is indeed great.

Reflecting on the various forms of iritis, it is with diffidence that one finally diagnoses a case to be of gonorrhœal

or syphilitic origin, but to face the task fearlessly is in the end the better way.

The case referred to, in which gonorrhœal iritis was diagnosed in a man whose history showed that infection took place 19 years previously, and upon the examination of whose prostatic fluid the gonococcus was found, illustrates the value of thoroughness—thoroughness not only in the diagnosis of such a condition, but the lack of thoroughness in treating the original infection. Time and again such a diagnosis is confirmed, and always in the same way. The gonococcus had been lurking in the prostate gland for years. One case in which the iritis was but moderately severe, in fact the attack was abating, when, as the result of prostatic massage, the inflammation in the eye became excessively severe. The anterior chamber was completely filled with gelatinous exudate and the pain was intense. The pupil was kept widely dilated with Atropine. The patient was placed in a nursing home, and had hot fomentations hourly. After several weeks the iritis completely subsided. Not a single synechia was left and the resulting vision was 6/5.

In chronically recurring forms of gonorrhœal iritis a gonorrhœal vaccine, together with prostatic massage, will do good. In focal or toxic forms, almost every dentist one has spoken to has had cases where, upon the extraction of one or more teeth, the patient has had cessation from constant eye trouble. But neither doctor nor dentist can diagnose which teeth are at fault. Dental radiograms must be produced both for the doctor and the dentist to decide which are and which are not healthy teeth.

To illustrate this. A lady who consulted a Harley Street dentist and another in Edinburgh, was declared to have a healthy set of teeth. While travelling abroad, she suffered from an attack of iritis in one eye. Upon returning home dental radiograms were asked for. At first she refused, but upon the advice of her doctor she relented. As the result of X-raying her teeth, it was found that the roots of no less than fifteen teeth were infected. She spent three months having these removed. This occurred several years ago,

but since then she has not had an attack of iritis. Dental radiograms should be the rule, not the exception, both with doctors and dentists.

With regard to syphilitic forms of iritis, the diagnosis from the history of the case is not always easy. Many of these patients firmly believe they have never contracted syphilis; others, even to their doctors, attempt to hide the fact. In one case the patient at first denied he had contracted this disease, but was found suffering from one of the worst forms of pseudo-tumour or gummatous cellulitis of the orbit that has been recorded (see Plate VI). As the Wassermann reaction was strongly positive, he was again questioned and it was discovered that four years previously his doctor told him that a small wart which had appeared on the penis was not a chancre. In reality it was an aberrant form of chancre such as was so often seen among the troops in France.

If the iritis has appeared in a case which had suffered several years previously from interstitial keratitis, the scars of which can be seen in the cornea, the Wassermann reaction may be or may not be positive. It has been said in a previous chapter that in acquired syphilis the Wassermann reaction can indicate the result of treatment, but in congenital cases it is the clinical manifestations which must be observed as the measure of thorough treatment. Therefore, in a case of iritis due to acquired syphilis, the Wassermann reaction will be the best guide.

Another example will show how one can infer from a patient's own statement what is the probable cause of the disease. A patient aged 46 discovered that the sight of one eye was becoming slightly dim. When the eye was examined, it showed not the slightest sign of inflammation, but a faint nebulous haze was spreading across the cornea. The patient unwittingly volunteered the information that her father had locomotor ataxia, and without stating the diagnosis except to the patient's doctor, Mist. Hydrarg. c. Iod. was prescribed, with the happy result that not a trace of opacity was left in two months' time.

The action of Atropine in iritis is as follows. First it keeps the iris and ciliary body at rest. It diminishes the hyperæmia and prevents the formation of posterior synechiæ, or breaks down those already formed. Atropine ointment 1 per cent. should be used thrice daily. The use of 2 per cent. Atropine ointment is best left to the ophthalmic surgeon.

Some patients have an idiosyncrasy for Atropine. One may see the eyelids, after a few applications of the ointment, swollen, the conjunctiva chemosed, the skin swollen down to the angle of the mouth, the appearance closely resembling that of erysipelas. All it is necessary to do, if this happens in any particular case, is to substitute ½ per cent. Hyoscene ointment for the Atropine, and smear the skin surface with Zinc ointment.

Cyclitis

Passing from iritis, we briefly take up the study of cyclitis. The ciliary processes, about 70 in number, are disposed radially from near the root of the iris. The term uveitis is used on the Continent to indicate an inflammation of the iris and ciliary body. It is not a good term to use, although it will illustrate the frequency with which inflammation involves the tract as a whole. It is probable that iritis never occurs without some cyclitis and vice versa.

Clinically, we say cyclitis is present when we find keratitic deposits have formed on the posterior surface of the cornea. They are commonly referred to as "K.P." and are looked upon with anything but a favourable eye. These deposits are exudates from the ciliary body passing through the pupil into the anterior chamber. They may organise and completely close the pupillary margin of the iris. Also they may organise and form membranous opacities in the vitreous, and sometimes a cyclitic membrane. These may finally form bands which usually cause detachment of the retina. The intra-ocular tension becomes lowered

and the eye is quite soft to the touch, the end result being a shrunken globe (phthisis bulbæ).

Fortunately all cases of cyclitis do not end thus. If the cause of a cyclitis be a toxin from a septic focus, and that septic focus can be discovered, such as a suppurating antrum or an ethmoidal sinus, then a cure may be effected, although relapses are frequent. Sepsis in the pelvic organs of women will cause a cyclitis, later becoming a chronic irido-cyclitis.

The writer can recall a case in which he discovered the presence of a diseased uterus. There had been a purulent vaginal discharge for four years, together with a contemporaneous history of irido-cyclitis in both eyes for three years. When the patient was first seen, the left eye was completely blind, and the right eye, although not blind, was in a state of inflammation. The operation of hysterectomy produced a most favourable result. The inflammation began to subside before the patient left hospital, and now for five years, during which time a cataract was removed, she has been able to attend to the wants of her family.

How can one recognise K.P. ? If a beam of light is thrown on the cornea by means of a magnifying glass, minute white dots are seen scattered over the posterior surface of the cornea in a characteristic form, that of a triangle with the apex opposite the pupil and the base across the lowest part of the cornea. If the disease has subsided, the small dots will have become brown. The keratitic deposits consist of leucocytes deposited from the aqueous.

If the irido-cyclitis is due to defective teeth, the removal of such may be followed by a cure. Singularly enough one of the most successful cases seen was that of a dentist's wife who promptly had her diseased teeth removed. The K.P. quickly disappeared and vision returned to normal and has remained so for several years.

If the cause is syphilis the case is anything but a favourable one. Plastic exudates are everywhere and the vitreous

becomes completely clouded. I have not seen a single case of recovery, although it should not be said that such a case, if recognised early, is incurable.

Again let me remind my readers that the iris should be kept dilated by means of Atropine. In cyclitis as in iritis, hot bathings or the constant use of a Japanese muff warmer are of the greatest help.

Regarding medicines, salicylates do good in some cases. Small doses of calomel are of use, but the general practitioner should always have the guidance, if possible, of an ophthalmic surgeon in these serious cases.

CHAPTER VII

DISEASES OF THE CHOROID AND THE RETINA

It is not my intention to make this chapter an exhaustive one, but there are a few conditions with which the doctor in general practice should be familiar. If he will learn to use the small electric ophthalmoscope (see Fig. 26), to which I have referred several times in this little book, he will readily appreciate the following conditions.

Choroiditis and Retinitis

One of the commonest forms of choroiditis to be met with is that known as disseminated choroiditis. This disease is usually found in syphilitic patients, either congenital or acquired. In cases of interstitial keratitis, due to congenital syphilis, if the patient has been thoroughly treated one does not find choroiditis afterwards, as was common in untreated cases, and this was one of the most marked things discovered when writing my *Preliminary Report on the Treatment of Interstitial Keratitis*. The appearance is seen in the coloured illustration (see Plate III, Fig. 2). Scattered throughout the retina are groups of choroidal pigment over which the retinal vessels are seen to pass. Here and there instead of a patch of pigment one finds a white area crossed by a retinal vessel. The area is really the absent choroid and one is looking at the sclera. As well as these bare areas of the sclera some of the white patches are composed of connective tissue, and around the edges of the white patches black choroidal pigment is always found. This type of choroiditis may seriously affect the vision, especially when an inflammatory patch seizes upon

the macula, then central vision is hopelessly destroyed. For example, a girl, who was a congenital syphilitic, had disseminated choroiditis in both eyes; in one the macula was involved, but most fortunately the macula of the other eye was not affected.

There is also a form of retinitis produced by acquired syphilis and which closely simulates retinitis pigmentosa. The illustration just quoted might almost be taken as a picture of such a condition, except that the pigment is much finer, in fact threadlike, together with an absence of white patches. The retinitis pigmentosa of familial origin shows a normal retina around the optic disc and a normal macula, but at the equator of the eye again fine spiderlike tufts of pigment are found. The pigment lies near the retinal vessels and sometimes it is found lying on the vessels. In this latter type of retinitis pigmentosa vision is gradually reduced until blindness supervenes. Another type of choroiditis which might be mentioned is the solitary type and which is found usually associated with some form of sepsis, such as septic teeth. If the inflammation has subsided and the vitreous opacities have become absorbed, a large solitary whitish area with irregularly pigmented edges is seen. The retinal vessels may be found coursing across this area and, sometimes due to the inflammatory changes, large choroidal vessels are seen that have anastomosed with the retinal vessels, so that occasionally an apparent second optic disc is found.

Macular Disease

Again, there is a fundus condition strongly resembling this solitary patch of choroiditis. It is a disease of the macula with which ophthalmologists have just recently become acquainted. The appearance of this latter disease is shown in Plate III, Fig. 1. The commonest variety in middle-aged people begins with fine hæmorrhages at the macula often semicircular in shape and partly enclosing the macula. The macula itself gradually changes from its normal pink colour to that of a dark cream. The vitreous does not

FIG. 1. [*R. Lindsay Rea.*

FIG. 2. [*R. Lindsay Rea.*

become clouded in contradistinction to what occurs in the case of a solitary patch of choroiditis, so that the gradual changes can be carefully noted from the earliest onset of the disease until the termination. The pathological changes produced at the macula are chiefly deposits of connective tissue which involve both retina and choroid. Sometimes instead of connective tissue there are spots of erosion seen in the large degenerated area. Across these spots choroidal vessels pass. Central vision is practically destroyed, although the peripheral field remains unchanged. The credit of bringing this disease to the notice of the ophthalmologist is due to Dr. Rayner Batten, who has in his possession an unequalled number of illustrations of this condition and its varieties. His classification I will not give here as it is unnecessary, but it is to be remembered that although the first book on the subject of macular diseases was published in Germany in 1926 (*Die Scheibenförmige Entartung der Netzhautmitte*, by Drs. Junius and Kuhnt), yet for years previously Dr. Batten had been constantly demonstrating this condition. During the advanced years of life another type of macular degeneration presents itself. If the former condition which I have described is termed inflammatory, then this latter condition should be named degenerative. At first only pigmentary changes are seen at the macula. This pigment is fine and irregular, showing that only the retinal elements are involved. Fine, minute hæmorrhages are then found scattered over the macula and peri-macular region until a finer more irregularly pigmented area is seen surrounded above and below by white spots—what has been described as retinitis circinata—the central vision is entirely absent and many of these patients do not live long. Macular disease is almost always bilateral.

Diabetic and Albuminuric Retinitis

Another important form of retinitis is seen in elderly diabetic patients, it is usually bilateral. There is not the stellate arrangements of the white exudates at the macula as is seen in albuminuric retinitis. Together with the

white patches of exudate there are fine and somewhat semicircular shaped hæmorrhages scattered over the fundus. Retinal detachment is not found in this condition. Albuminuric retinitis does generally show the star-shaped arrangement at the macula, and the retina and optic disc are slightly obscured by a fine haze. There is slight swelling of the nerve head, so that the proper title should be albuminuric neuro-retinitis. The vessels generally show some definite degenerative change. It is seldom one sees diabetic retinitis apart from arterio-sclerotic change of the vessels, but in arterio-sclerotic retinitis in the early stage the fundus is clearly seen, although in the advanced stage, when fine flame-shaped hæmorrhages and minute yellowish exudates are present, the surface of the fundus is slightly indistinct. Diabetic retinitis does not occur under the age of 35, but I have seen marked arterio-sclerosis in a man of this age due to extreme alcoholic habits. It is the duty of the oculist when he has examined the eye of a patient, if he discovers the presence of arterio-sclerosis of the vessels or any other evidence of constitutional disease, to report the condition to the physician who is in charge of the patient's general welfare. Much can be done for patients who do not suspect that their blood pressure is raised, and such patients are always extremely grateful for such attention.

Tobacco Amblyopia

I have referred to alcohol as a cause of arterio-sclerosis but changes not perceptible to the eye take place in the optic nerve due to various drugs such as alcohol or nicotine. In tobacco amblyopia there may be very slight reduction of vision or it may be most marked. I have frequently seen patients with vision reduced to 1/60; such patients cannot discern red or green colours when held directly before them; in other words, they have a central scotoma for green and red. Tobacco alone will produce the worst form of amblyopia, and any kind of tobacco can produce it. Formerly tobacco amblyopia was found in

men of about middle age. It appears to me to depend upon the quantity of tobacco smoked and not as to whether a pipe or cigarette is used. Unfortunately, many women now smoke, and among such I have seen cases of tobacco amblyopia. In women it occurs at a much earlier age than in men. Those I have seen were in their twenties or early thirties, which seems to indicate that a woman's nervous system cannot withstand the effects of nicotine so well as that of the male. The habit now pursued by so many women is most unfortunate, and they find the habit much more difficult to forgo than do men. If tobacco amblyopia has shown itself, one thing must be done and that is entire cessation of tobacco smoking. There is not the slightest use in cutting down the amount consumed. The patient should be given Mist. Ac. Strychninæ.

Optic Atrophy

The appearance of the optic disc itself is extremely important. I would refer the reader to the frontispiece and would commend it to his serious study. The frontispiece is that of the normal fundus. Observe the difference in tint between the surface of the optic disc and the surrounding retina. If it were not for minute vessels scattered over the surface of the disc, the latter would be quite white, as is actually the case in Plate V, Fig. 2. Again, the central area of the disc is depressed, from the bottom of which emerge the retinal arteries, lighter in colour than the dark veins which pass into the optic nerve. A little more than two discs' breadth away is seen a faintly pigmented area, free from blood-vessels ; this is the macula, the most sensitive spot of vision. Suppose the retinal arteries were in a sclerotic condition, the surface of the vessels would show a greater reflection like burnished copper wire, and where the arteries cross the veins the latter would appear kinked and, in the most advanced cases of arterio-sclerosis, small hæmorrhages would be found at these crossings. When one detects hardened radial arteries, the vessels of the eye should be examined. Sometimes, in advanced arterio-sclerosis,

hæmorrhages are found along the whole length of the vessels and even the optic disc is found raised or swollen and the edge blurred. In dark-haired people there is a good deal of choroidal pigment, so that the optic disc appears by contrast whiter than normal, but one's judgment is always guided by the appearance of minute vessels on the surface of the disc. In optic atrophy the surface of the disc is devoid of minute vessels, so that the disc appears of marble whiteness. To distinguish between primary optic atrophy and secondary optic atrophy one has to remember the former has not been preceded by an inflammatory change, whereas the latter has followed inflammation of the nerve head (see Plate V, Fig. 1). What change would be found if an optic neuritis had been present? Firstly, the sharp edges of the disc become blurred. Secondly, the physiological depression or cup in the centre of the disc is filled in by exudates and, as follows any inflammatory change in the retina, fine irregular pigmentation appears around the disc, and lastly, the perivascular tissue of the vessels is thickened, showing as white lines alongside the vessels. Therefore, the difference in the appearance of the discs is as follows:

Primary Optic Atrophy	Secondary Optic Atrophy
(*a*) Sharp edges.	(*a*) Blurred edges.
(*b*) Physiological cup present.	(*b*) Physiological cup filled in.
(*c*) Normal choroidal pigment as in Frontispiece.	(*c*) Finely scattered irregular pigment.
(*d*) Sheaths of vessels invisible.	(*d*) Sheaths of vessels visible as white lines, accompanying the vessels as far as the equator.

The causes of primary optic atrophy are numerous. Degenerative changes descending from the brain, examples of which are tabes and general paralysis of the insane. Changes produced in the course of the optic nerve, such as fracture of the skull with involvement of the optic foramen causing damage to the optic nerve. Changes in the optic nerve at the level of the retina, produced by various forms of choroido-retinitis and toxic conditions.

a few months after birth. An intelligent mother can state when she has first noticed a change in the child's method of looking at objects.

Sarcoma

Illustration No. 14 is that of an eye which was recently removed from a young woman. She had noticed for a few months previously that the vision of one eye was gradually becoming poorer. Examination showed the vision reduced to 6/36, while the field was greatly diminished, particularly on the nasal side. With the ophthalmoscope a large mass was found protruding from the temporal side of the retina

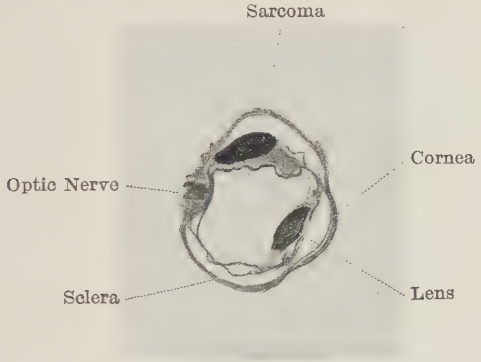

Fig. 14.—Section through an Eye showing a Sarcoma of the Choroid.

into the vitreous, its surface was clearly seen by using a + 8 lens in the ophthalmoscope. It appeared darker in colour than does the usual detachment of the retina, and one significant difference was that when a small electric lamp was placed against the eye in this region light did not pass into the interior of the eye; when there is merely fluid behind a detachment light is transmitted and in the darkened room the pupil glows with light, but in this particular case the pupil remained dark.

The Wassermann reaction of the blood was negative; there was not the slightest sign or symptom of tuberculosis in any part of the body, and one had most reluctantly to come to the conclusion that it was a case of sarcoma of the choroid. Such a case is urgent; so many cases have been

lenses are turned before the eye in the ophthalmoscope, the highest number with which the surface of the vessels is still distinctly seen is noted. If a 6-dioptre lens has been used, then, as one remembers 3 dioptres are equivalent to 1 mm. of swelling, so the case under observation shows a swelling of 2 mm. Such a case would be a pronounced one, and yet one has often seen such a swelling practically disappear in a few days after a decompression operation. If the case is that of syphilitic meningitis, decompression must still be done and anti-syphilitic remedies applied. Such cases usually result in full normal vision.

Glioma

In an earlier chapter I made a brief reference to glioma of the retina. This is a most malignant disease confined to infants. It appears to be congenital, although it may remain unnoticed for a few years. Fortunately, the disease is rare; sometimes it presents itself in more than one child of the same family. The pupil appears white. It runs a similar course to sarcoma of the choroid, but its extension is by means of metastasis to glands and cranial bones, and it may spread along the optic nerve to the brain. When a child affected by any form of blindness is brought to the doctor, he should at once suggest an examination by an oculist. This examination is carried out under an anæsthetic, atropine having been applied to the eye the previous day. During one morning quite recently two young children were thus examined; one was already blind, the duration of which was put at one month. Examination showed both discs swollen but quite pale; the cause most probably was a tuberculoma, single or multiple, in the brain. The second mother had noticed that her child, when wanting to see anything, never looked directly at it but turned his head slightly to one side. Examination of this child showed normal optic discs surrounded by normal retina but the macula of each eye was markedly and irregularly pigmented. This was a case of early macular inflammation; it may be intra-uterine or it may take place

a few months after birth. An intelligent mother can state when she has first noticed a change in the child's method of looking at objects.

Sarcoma

Illustration No. 14 is that of an eye which was recently removed from a young woman. She had noticed for a few months previously that the vision of one eye was gradually becoming poorer. Examination showed the vision reduced to 6/36, while the field was greatly diminished, particularly on the nasal side. With the ophthalmoscope a large mass was found protruding from the temporal side of the retina

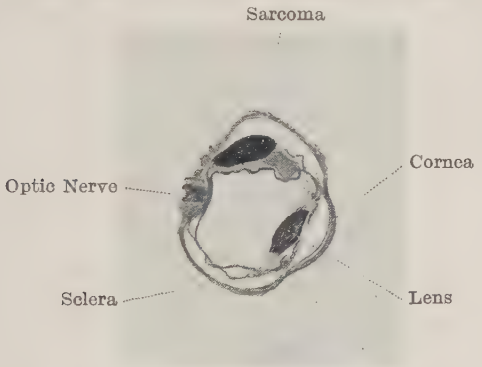

Fig. 14.—Section through an Eye showing a Sarcoma of the Choroid.

into the vitreous, its surface was clearly seen by using a + 8 lens in the ophthalmoscope. It appeared darker in colour than does the usual detachment of the retina, and one significant difference was that when a small electric lamp was placed against the eye in this region light did not pass into the interior of the eye; when there is merely fluid behind a detachment light is transmitted and in the darkened room the pupil glows with light, but in this particular case the pupil remained dark.

The Wassermann reaction of the blood was negative; there was not the slightest sign or symptom of tuberculosis in any part of the body, and one had most reluctantly to come to the conclusion that it was a case of sarcoma of the choroid. Such a case is urgent; so many cases have been

seen at hospital and in private by various physicians and surgeons where pigmented growths were found scattered over the body and the history was that an eye had been removed for some reason or another, some years previously. Sarcoma of the choroid is a most malignant growth ; the sarcomatous cells are disseminated and metastases occur in the liver and elsewhere. As soon as this condition is discovered, the eye, together with a long portion of optic nerve, should be removed. In this particular case the growth had not quite penetrated Bruch's membrane. It was in what is known as the quiescent stage. If it had been allowed to remain the tension of the eye would have risen. This is known as the glaucomatous stage. Next the growth would penetrate the outer coat of the eye, but long before this happened the sarcomatous cells would have been disseminated through the veins to other parts of the body.

CHAPTER VIII

GLAUCOMA

Glaucoma is a disease of the eye which, sooner or later, is seen by every general practitioner. Many a doctor regrets that he has not learnt to feel the tension of an eye while in the ophthalmic wards at hospital.

Glaucoma is that state of the eye in which damage is done by increasing intra-ocular tension. The exit of the normal circulating fluid of the eye is hindered while the amount of the ingoing fluid remains the same or may be increased.

It is a disease of adult life. It is most frequently associated with hypermetropia, and is rather uncommon in myopia.

Primary glaucoma is produced by the pressure of the lens, which gradually increases in size during life. The peripheral border of the lens approximates closely to the ciliary body. If the lens and the ciliary body come into contact, the circulation of the aqueous fluid is interrupted. The effect, according to Priestley Smith, will be to prevent the fluid which is secreted by the ciliary body from passing forwards through the pupil. The lens will, therefore, be forced forwards, and will push the iris in front of it, making the anterior chamber very shallow and bringing the root of the iris into contact with the corneo-scleral junction. In this manner, what is known as the filtration angle, that is the angle between the root of the iris and the corneo-scleral junction, will be blotted out. As it is from this angle, through the fibres of the ligamentum pecinatum that the aqueous escapes to Schlemm's canal, it is obvious that the tension of the eye must rise. If there is a complete

blockage then an acute attack of glaucoma is produced; if it is not complete, then a subacute attack is caused. In this latter condition, the eye may not even be red, although in acute glaucoma it is frequently most difficult to diagnose the condition from an acute iritis.

Primary glaucoma usually occurs after 50 years of age.

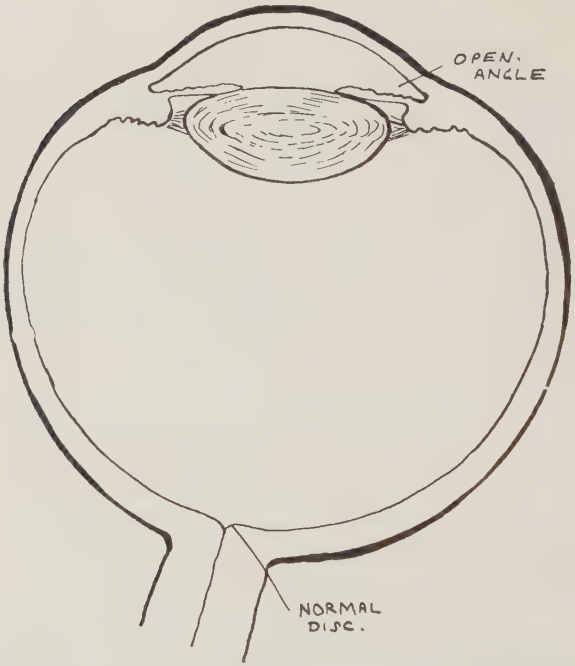

Fig. 15.—Diagrammatic Representation of Normal Eye.
Note wide angle between root of iris and cornea, also level optic disc.

It is remarkable that sometimes it is hereditary, occurring at an earlier age in each succeeding generation.

Myopic eyes, being somewhat larger than hypermetropic eyes, are therefore, from an anatomical standpoint, less liable to the onset of this disease. In hypermetropic eyes with small corneæ, glaucoma is very likely to supervene sooner or later.

As age advances, the anterior chamber of the eye becomes smaller, so that the combination of the following

anatomical states, a small cornea, a shallow anterior chamber, and a gradually enlarging lens, tends to produce the condition known as glaucoma (see Figs. 15 and 16).

As one grows older, sclerosis of the various tissues takes place, that of the eye not escaping, so that the ligamentum pectinatum may become thickened. Very occasionally,

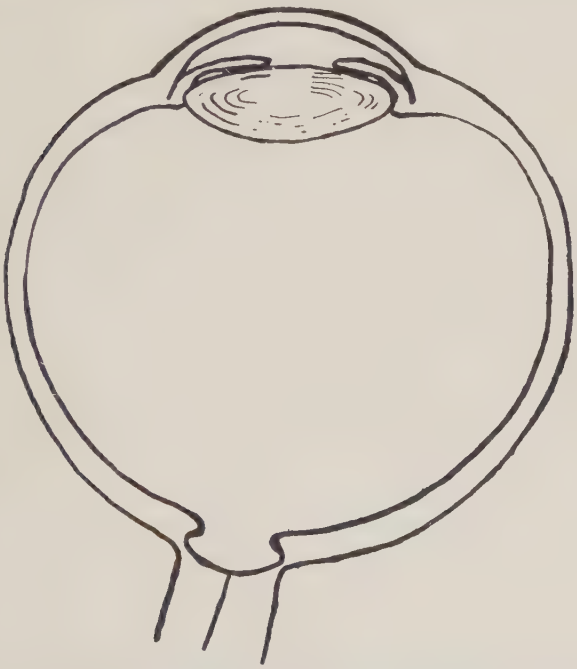

Fig. 16.—Diagrammatic Representation of Glaucomatous Eye.
Note closed corneo-iridic angle, also deep optic cup.

just as syphilis can produce sclerosis of arteries and veins elsewhere, so the region of the pectinatum may become sclerosed.

One case of what was presumed to be idiopathic glaucoma, and in which the sight was rapidly diminishing, was trephined. But as the wound healed the patient developed typical interstitial keratitis, and it was only then that a strong Wassermann reaction of the blood was discovered. Such a case is comparatively rare.

Reference to Fig. 13, page 43, will indicate the situation of the canal of Schlemm, which is close to the root of the iris, and if it is imagined that the space between the lens and the back of the cornea is lessened, then the iris will be carried forward also and the angle at the root of the iris, close to the canal of Schlemm, will become obliterated. The canal of Schlemm itself may be almost obliterated, so that cessation of filtration at this angle may take place.

Reference again to the illustration will show that the most likely part of the eyeball to give way is the entrance of the optic nerve through the lamina cribrosa. The surface of the nerve head becomes concave, and as the pressure within the eyeball rises, so the concavity is increased. The pressure will cause the fibres of the optic nerve to atrophy, so that blind spots may be found within the field of vision. A glaucomatous cup differs from a physiological cup by its exceedingly sharp overhanging walls. The vessels are seen to dip suddenly into this hollow and may disappear behind the overhanging edge to reappear again, passing to and from the eye. Where the vessels bend over the edge of the optic cup the pulsation of the veins and arteries may be noticed. The raised intra-ocular pressure causes degeneration of the nerve fibre layer of the retina. The choroid becomes thinned. The patient often complains of severe pain, usually of sudden onset. Coloured haloes are seen around lights. A candle, for instance, may be seen distinctly by one eye, and with the other appear misty and with coloured haloes around the flame.

The onset of glaucoma may be so sudden that the patient really has not time to notice these coloured haloes, for vision has diminished to counting fingers or merely seeing hand movements, and the pain may be so severe that the patient is quite sick. One patient suffering from acute glaucoma said she thought the trouble was more with her stomach than with her eyes. The pain was intense, radiating all over the head. Sleep was impossible, and yet, as soon as the intra-ocular tension was reduced by trephining, the pain disappeared and the sickness at once passed away.

The average case of acute glaucoma fortunately is not quite so severe. The pupil is seen to be slightly dilated and immobile as the ciliary nerves passing through the choroid from the posterior of the eye suffer from pressure. Diminution of vision is due to cloudiness of the media, poor intra-ocular circulation and pressure on the retina. The epithelium on the surface of the cornea becomes œdematous so that the pupil is not readily seen. But it is remarkable how quickly, on reducing the intra-ocular tension, the cornea becomes quite clear.

In cases of subacute glaucoma the tension varies greatly. The patient sometimes sees coloured rings due to increased tension on the cornea. At other times the rainbow lights are not seen. It is noticeable that worry and anxiety will increase the tension of such an eye. The colour that is imparted to the pupil by the œdematous corneal epithelium gives it a bluish green tint, hence the term "glaucoma," the Greek equivalent for "sea green" (see Plate I, Fig. 6).

Between the attacks in subacute glaucoma, the field of vision is found to be gradually decreasing. Frequently the period during which the intra-ocular tension of the eye increases is prolonged. Gradually the eye becomes harder. Coloured rings may or may not be seen. The field of vision very gradually narrows, and if the size of the blind spot is reproduced, say by Bishop Harman's scotometer, it is found to be enlarged beyond the normal. It is in such cases that an acute attack may suddenly supervene.

In women venous congestion, associated with menstruation, worry, an illness or the worry consequent on such an illness, seems to be the exciting cause. It is in such a condition also that if the eye is slightly red the diagnosis of iritis may be made and Atropine instilled. In chronic glaucoma, which is insidious in onset with periodic attacks of slight neuralgic pain and occasional coloured haloes around lights in the evening, a real attack of acute glaucoma may be precipitated if Atropine is instilled.

The appearance of an eye suffering from acute glaucoma strongly resembles an eye suffering from acute iritis. If it

is iritis and Atropine is withheld sight may be lost through extensive posterior synechiæ being formed. If it is glaucoma the application of Atropine but intensifies the disease. When one realises that glaucoma may destroy vision in 24 hours, it is incumbent that a correct diagnosis be made. The corneal microscope has come to our aid. If the pupillary margin can be seen at all in glaucoma, there is no newly formed pigment present and therefore no synechiæ. Further, in glaucoma the œdematous epithelium is first noticed, whereas in iritis the aqueous in the anterior chamber is seen to be full of fine exudates while the cornea itself still remains clear.

To help the doctor diagnose between glaucoma and iritis, the symptoms of each disease are placed side by side as follows:

Iritis	Glaucoma
May occur at any age, often in young and middle-aged people.	Usually the patient is beyond the age of 50 years.
One eye is affected, with a history of gradual or sudden onset without prodromal symptoms.	Both eyes usually show some symptoms. There is a history of prodromes in 75 per cent. and the onset is remarkably sudden.
Cornea is clear but aqueous humour may be cloudy.	Cornea is steamy. Sensitiveness is reduced, and aqueous clear.
Anterior chamber usually deep.	Anterior chamber shallow.
Pupil usually contracted.	Pupil slightly dilated and may be oval shaped.
Iris is a muddy colour.	Iris, if seen, is clear.
Pigment or posterior synechiæ often present, or pigment deposits on the lens.	Deposits and synechiæ absent.
Reaction of the pupil sluggish. Deep circumcorneal injection.	Reaction often absent. The whole eye is injected uniformly.
Tension normal or slightly soft. Rarely raised.	Tension raised so that eyeball feels quite hard and cannot be dimpled with the finger-tips.
Neuralgic pain both in eye and around orbit.	Pain severe, radiating all over the head. Often accompanied by sickness.
Attack may last for weeks, but if pupil is kept dilated by means of Atropine, sight may not be at all impaired.	If Atropine is instilled, it usually means destruction of vision.

Take the following illustration. A lady aged 56, suffering from acute glaucoma in one eye, and who stated she had had several attacks previously, but not so painful or blinding as the present one, was found to be suffering intense pain and gastric disturbance. The eye was quite red. The cornea was so hazy that the pupil was seen with difficulty. This was at 4 p.m. She proceeded at once to a nursing home, where a drop of 1 per cent. Eserine and hot fomentations were applied hourly. A strong purgative was also given. By ten o'clock the pain had lessened considerably. The sickness had disappeared. The cornea had become quite clear, and the somewhat immobile pupil reduced in size by the action of the Eserine. The following morning the patient was quite comfortable, and vision was once again clear. What should be done? The patient was kept in bed for four more days until the eye had become much quieter. Remembering that the patient had sustained several attacks previously, each becoming worse than its predecessor, the eye was trephined and rapidly became its normal colour; full vision together with practically a full field remained. There is now no fear of a further attack of acute glaucoma.

A word regarding secondary glaucoma. Glaucoma in this instance follows upon some other disease. If the pupillary margin of an iris shows complete posterior synechiæ (occlusio pupillæ), the result of an attack of iritis, the aqueous cannot escape through the pupil to the anterior chamber, iris bombé is produced, and unless the iris is perforated either by passing a fine Graefe knife through and through or performing an iridectomy, the tension of the eye will rise.

If the capsule of the lens is left in a corneal wound after excision for cataract extraction, secondary glaucoma may follow.

Traumatism of the lens producing swelling of the latter, raises the tension of the eye.

Dislocation of the lens may produce secondary glaucoma, also it must never be forgotten that one of the symp-

toms of intra-ocular tumour may be raised tension also. These are among the chief causes of secondary glaucoma.

A question that is sometimes asked of the ophthalmic surgeon—can eserine cure chronic glaucoma? Although the use of Eserine or Pilocarpine will reduce the tension of a glaucomatous eye, they never cure chronic glaucoma. It may be necessary to use either of these myotics for weeks or months, but if the field of vision is found to be decreasing, only good can come from an immediate trephining operation.

Readers of this chapter will readily see that trephining rather than performing an iridectomy is the writer's operation of choice, and as the result of doing a considerable number of trephining operations, there is not the slightest cause to regret having made this choice.

CHAPTER IX

SIGNS AND SYMPTOMS OF ERRORS OF REFRACTION

During each holiday season doctors are frequently consulted regarding various symptoms shown by young people home from school. One of the commonest causes of headaches in children is an error of refraction.

Although ophthalmology may be among the subjects for the M.B. Examination, it is seldom that any serious attention is paid to such conditions of the eye resulting in what is commonly known as errors of refraction. Therefore one may be pardoned for stating a few elementary facts with regard to this subject.

The normal eye of an adult measures on an average 23 mm. in its antero-posterior diameter. The various media together form a lens or a focusing arrangement whereby parallel rays of light entering the cornea in front are brought to a sharp focus at the retina behind.

Hypermetropia

Suppose a state of hypermetropia exists, that is, the antero-posterior diameter of the eye is less than 23 mm., the rays will not be brought to a focus on the retina but will meet somewhere posterior to it. There are various conditions of the eye which will produce hypermetropia as well as this abnormal shortness of the eye, but we need not be concerned with these for the moment.

Young people with hypermetropic eyes have the power, by using their accommodation, that is, allowing the lens to become more convex, to focus rays on the retina. The focus which would lie behind the eye is brought for-

ward to the retina. In those with strong power of accommodation, vision is not interfered with at all. In fact, all children when born are hypermetropic, with very few exceptions.

At a large school, where for some time the writer has had the care of the children's eyes, it is the rule to examine under a mydriatic each child entering the school. With the rarest exceptions some degree of hypermetropia is found to be present.

In order to follow intelligently what is meant by accommodation, if a child 10 years of age is given some finely printed book to read, and told to bring it as close to the eye as possible, he will continue to read until the book is but $2\frac{3}{4}$ inches from its eye. The same child when 15 years of age can read the same print at just a little over 3 inches, but at 25 years of age, the distance will have receded to 4 inches. At 40 it will be 7 inches, but at 45 it will be 10 inches ; and so it is seen that the ciliary muscle which is responsible for the increase of the curvature of the lens is gradually growing weaker throughout life. At 60 years of age there is little or no accommodation present.

The effect of instilling Atropine, or other drugs which are known as mydriatics, is to paralyse the ciliary muscle, and therefore the power of accommodation. A great many children in the full vigour of health can readily accommodate continually to the extent of 2 dipotres without showing any symptoms whatever.

What is a dioptre ? A dioptre is a lens whose length of focus is equivalent to almost 40 inches. A child whose media is deficient in refractive power, say of 4 dioptres, must in the attempt to see distant objects clearly, exert accommodation to this amount. A 4-dioptre lens is equivalent to one of 10-inch focus.

Suppose a boy aged 10 on returning home from school tells his parents he has had frequent headaches. His eyes may appear to be perfectly normal. In the surgery it is found he has 6/6 vision in each eye. He can read the smallest print held, say, 10 inches away. What can cause

his headaches ? In such a case the doctor must never forget that he cannot exclude the presence of hypermetropia without paralysing the ciliary muscle by means of the installation of Atropine. If the boy's constitution seems sound, and his digestive organs are performing their functions in a normal manner, it is imperative that his eyes should be examined.

A doctor in charge of school children may, at this stage, put forth the query, if a boy aged 10 or 12 has from 1 to 1½ dioptres of hypermetropia, would you prescribe spectacles for such a condition ? Experience with many school children has taught one that such a query cannot be answered by an unqualified yes or no. If the child is in good health and does not suffer from headaches and is able to learn his lessons in a normal manner, there is no need to inflict the wearing of glasses upon him. But if he is not very robust, if he complains of occasional headaches, then by all means prescribe little more than half his total error, to be worn only during school hours.

Some parents are greatly distressed when informed that their child must wear spectacles, but in the condition of hypermetropia, there is the strong probability that as the eye increases in size together with the child's growth, so the refraction will become normal.

In the large school to which the writer has referred he has been able often to tell a boy or girl to put aside their glasses. What then have the glasses accomplished ? Firstly, they have saved the child from headaches. Secondly, they have saved him from constant nervous strain, and thirdly, from producing an aversion to the study of books. Thus the mental and physical growth of the child have not been impeded by imperfectly functioning eyes.

Here are three brief illustrations of how strain on the accommodation unrecognised may produce disastrous results. A girl aged 16 was brought by her father. She was nervous, highly neurotic, and under-developed. At each school inspection she was found to have 6/6 vision in each eye and so had never worn glasses. Using 2 per

cent. Homatropine, the effect of which passes away in twenty-four hours, it was found she had 4 dioptres of hypermetropia in each eye. If this girl had worn her proper correction since 5 years of age, one would not have had to deal with so poor a specimen of girlhood.

A doctor's child aged 5 was seized with a fit, and rolled down the front door steps into the arms of his aunt. She was a medical woman and was greatly distressed at such an occurrence. The boy appeared to be vigorous and healthy. Later on he again became unconscious. The attacks did not resemble epilepsy, so in order to elucidate the case, the writer was asked to examine the optic discs for a possible state of papillœdema or optic neuritis. The physician had in mind a neoplasm of the brain. Under Atropine the fundi were found to be perfectly normal, but there were fully 3 dioptres of hypermetropia present. Glasses were promptly prescribed to be worn constantly, with the happy result that only once during the past three years was there anything that would approach to the semblance of a fit. Father, mother, aunt, and nurse all state that the child's health has improved enormously and nothing was done beyond prescribing spectacles for the correction of 3 dioptres of hypermetropia.

This third case is one of great interest. A mother brought her two young children from abroad, one aged 7 to have the eyes examined, as it was thought she could not see properly. The other child, two years younger, showed poor mental development, and was to be placed under the care of a children's specialist. One would scarcely think it possible that any physician, knowing that one child had 8 dioptres of hypermetropia, could forget the probability of an error of refraction existing in the child under his immediate observation. But indeed such was the case. The suggestion came from the mother, and in accordance with her wishes, the younger child's eyesight was examined. It had 9 dioptres of hypermetropia in each eye. This child was given the proper correction, was placed under the care of a capable governess, and when

seen two years later it was astounding to see the mental ability the child had acquired during the interval.

It is a remarkable fact that physicians both in private practice and in hospital are at last realising the enormous benefit that can accrue from the wearing of properly prescribed glasses. In a recent lecture at the Royal Society of Medicine it was stated that headaches, including migraine, could often be improved by the careful prismatic correction of slight muscle imbalance, and it was suggested that the investigation of any case was not complete without an examination of the balance of the extra-ocular muscles of the eye. It has been the writer's custom for years to examine the muscle balance of each case seen, and therefore one can emphatically state that one of the greatest causes of headache is not due to muscle imbalance, but to the presence of hypermetropia or hypermetropic astigmatism which has not been corrected, or the correction of which has been done in a faulty manner.

Myopia

Myopia or short sight is the opposite condition to hypermetropia or far sight. Here the commonest condition is due to a lengthening of the antero-posterior diameter. It is an acquired condition, and one which does not escape the attention of the parents or the doctor so readily as that which we have just been discussing. The child with myopic eyes cannot see blackboards, maps, or pictures as clearly as his normally sighted companions. Sooner or later he is made to sit in the front row of the class. It is not long before subconsciously he realises that he cannot see as well as others. Such children usually have an abnormal fondness for books, and they avoid the full amount of play indulged in by their companions. They read, holding the book close to them, at times when they should be playing. They are allowed to read in bed by indulgent parents or servants, and it is among these children that one has found the worst forms of progressive myopia. A child should not be allowed to read in bed.

In the consulting-room a child will say, to the parent's astonishment, that he has been given books to read when going to bed. A child who recently made this statement was 8 years of age and had 9 dioptres present. This amount had been rapidly acquired.

Fortunately the average case is not so marked. A child returns home from school with the report that he should have his eyes examined as he cannot see distinctly. Again the accommodation is paralysed by means of a mydriatic. The amount of the error is estimated, and that glass given which will give the child the normal 6/6 vision, so that all possibility of eye-strain is excluded.

Astigmatism

Astigmatism simply means that the curvature of the cornea is not that of a Soccer ball but that of a Rugby ball. Its two chief meridians are of unequal radii. It may be corrected by a convex cylinder if of the hypermetropic variety, and by a concave cylinder if myopic in character, or a combination of both, when it is known as mixed astigmatism.

At all ages eye-strain or asthenopia is the result if the error is not corrected by proper glasses. The remarkable fact is clear to every oculist that it is the smaller errors which produce the worst symptoms. This is due to the eye making the attempt to accommodate so as to produce the clearest image possible, which it does not attempt to do if the error is great.

In the outpatients' department of a hospital for nervous diseases the study of the symptoms produced by errors of refraction is highly illuminating. What is of much greater interest is the result of properly prescribed spectacles. For some years we have carried out the estimations of errors of refraction at the West End Hospital for Nervous Diseases, and results have been obtained which have convinced us that even such central nervous disturbances as epilepsy, severe migraine, nervous debility, can be affected, most profoundly in selected cases, by such

glasses as will eliminate the possibility of throwing upon the ciliary muscle a strain which, physiologically, it was never intended to bear.

Presbyopia

It has been mentioned in a previous paragraph that the ciliary muscle within the eyeball continues to weaken throughout life. At 45 years of age, the nearest point which can be accurately focused by a normal eye is 10 inches. As no one endeavours to read always at the nearest point of vision, then reading print must be held further away. As the patient becomes older, this distance continually recedes, so that in order to read comfortably at 14 inches a convex lens must be employed. The spectacle that was commonly termed by opticians "clearers" was simply $\frac{3}{4}$ dioptre in strength. If the patient is hypermetropic and has never worn glasses, then presbyopia appears to come on much earlier in life. If the patient is myopic he may prefer not to use glasses at all for reading but holds the print the distance at which he can clearly see. This is the explanation why some patients about 80 years of age can read without glasses: they can see print but not an advertisement across the road because they are myopic or short-sighted.

CHAPTER X

SQUINT: ITS CAUSE AND TREATMENT

Each eye lies in a bed of fat, its movement being governed by six muscles, four straight and two oblique. Fig. 17 represents the appearance of the eyeball and muscles to the reader looking down from above.

The internal rectus attached to the inner side of the eyeball when it contracts turns the eyeball inwards.

The external rectus turns the eyeball outwards.

The superior rectus turns the eyeball upwards and slightly inwards, while the muscle not shown as it lies beneath the superior rectus, the inferior rectus, turns the eyeball down and slightly in.

The superior oblique passes through a small cartilaginous pulley and passing across above the eyeball is inserted posterior to the equator. The remaining line represents the inferior oblique and is inserted below the eyeball and behind the equator. The superior oblique contracting and pulling through the ring, rotates the eyeball downwards and outwards.

The nerve which supplies the superior oblique is the fourth cranial nerve, called by older anatomists patheticus from its action on the eyeball. The inferior oblique by its contraction rotates the eye upwards and outwards.

The balance produced normally by the twelve extra-ocular muscles is such as to produce single vision, so if there is a paresis or partial paralysis or complete paralysis of the sixth nerve supplying the external rectus then the unopposed pull of the internal rectus which is supplied by the third cranial nerve will rotate the eye inwards. Such a squint would be known as a paralytic squint, and practically

all those I have seen in babies have been produced by the use of forceps during a difficult confinement. In older children it may be due to acute polio-encephalitis.

Recovery is far from common, but in adult life, when there is a tendency for the internal rectus to weaken, the eye will appear practically straight, but the patient will still be unable to rotate the eye outwards beyond the middle line.

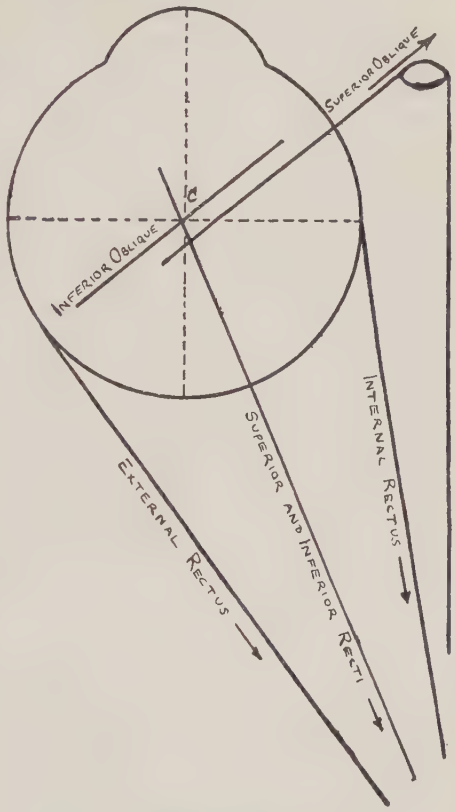

Fig. 17.—Diagram of Left Eyeball and Muscles.

I have mentioned that the superior oblique is supplied by the fourth cranial nerve, the external rectus by the sixth. All the remaining muscles are supplied by the third. The levator muscle of the superior eyelid is also innervated by the third cranial nerve, so that a complete paralysis of the third nerve would be recognised by the following signs. The eyeball would droop, as it is no longer supported by the superior rectus, it is rotated outwards by the unopposed action of the external rectus supplied by the sixth nerve, and the downward and outward rotation is also augmented by the pull of the active superior oblique, while ptosis or hanging down of the superior eyelid will also be seen.

Diplopia

If one muscle only is paralysed, say the left external rectus, then on looking to the left the patient will have double vision. This is known as diplopia. In Chapters XIII and XIV some of the causes that produce paresis and paralysis of the various extra-ocular muscles are mentioned, but it would be more fitting to consider in this chapter a type of diplopia that has not been commonly recognised. It is diplopia produced by a hæmorrhage into a muscle and is generally found in patients suffering from raised blood pressure. Most commonly it is a vertical diplopia, that is, objects seen are doubled and placed one above the other. A typical example of which the writer has seen quite a number is as follows :

A lady about to leave her house suddenly saw the stairs leading down from the doorway appear doubled, one flight on a higher plane than the other. The sensation was both painful and nauseating. Double vision, however produced, will cause some degree of sickness, but this type of diplopia comes on with intense suddenness and is actually painful. Dr. A. F. Voelker when examining this patient found the systolic blood pressure raised to 297 mm. ; the diastolic was abnormally high also. The patient was put to bed, the blood pressure was gradually reduced and in three months' time the diplopia had entirely disappeared. This history of recovery is common to all of these cases. Apparently there is absorption of the hæmorrhage and the full function of the muscle is restored.

Allied to this type of diplopia is that seen in people who have suffered from severe shock in motor-car accidents. The gradual recovery of a paresis or partial paralysis of a superior rectus can be observed by the use of the Maddox rod. A case of a lady author who had been in a motor-car accident, and was compelled to forgo her work on mathematical tables due to this type of diplopia, showed the gradual recovery from 15 prism dioptres through 10 then 6 and finally back to normal.

Concomitant Strabismus

The squint with which we are more directly concerned at the moment is not a paralytic form, but what is known as concomitant strabismus. This is the most usual variety met with. There is no paralysis concerned in this squint. In the previous chapter the action of accommodation was explained. If the ciliary muscle within the eye allows the focus of the lens to increase by 1 dioptre, then remembering that a 1-dioptre lens is one the focal length of which is a metre or roughly 40 inches, the eye is really looking at a point 40 inches away. Suppose both eyes rotate towards the middle line so that both visual axes meet 40 inches away from the nose, then each eyeball has rotated through one metre angle. Suppose again that each eye is looking at a point 10 inches away, as in Fig. 18, then each eyeball has rotated inwards through 4 metre angles and the accommodation will have increased simultaneously 4 dioptres also. It is quite plain therefore that the action of accommodation is linked up with convergence of the eyeballs, the ciliary muscle internally and the two

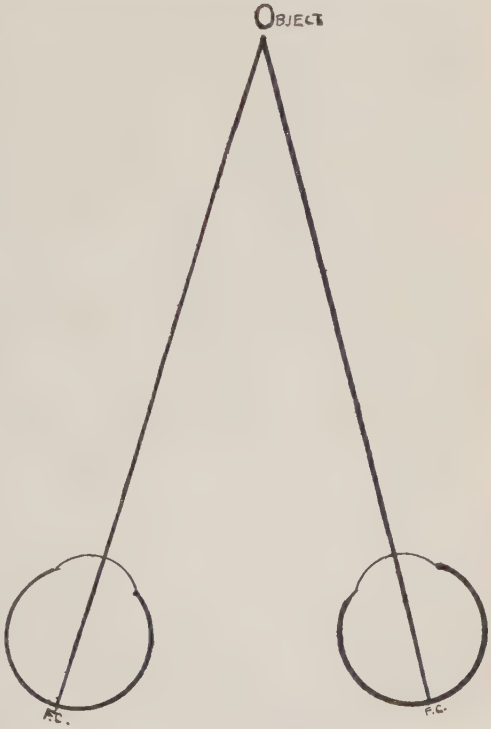

Fig. 18.—Normal Convergence.

internal recti externally, both being supplied by the third cranial nerve. But what will happen in the case of a hypermetrope who requires a 4-dioptre lens to focus distant objects and who has not glasses to aid him ? Not only will he have to exert 4 dioptres of accommodation to see a point 10 inches away, but he will have to exert a further 4 dioptres to compensate for his hypermetropia. Such strong innervation to the ciliary muscle, by equalling 8 dioptres within the eye, is accompanied by an effort of the recti muscles to rotate both eyeballs inwards to a point 5 inches away, yet the patient is striving to see a point 10 inches away. Here is a conflicting issue. The result is obtained by both visual axes being rotated through 8 metre angles, and as one visual axis is directed to a point 10 inches away the other visual axis will be directed to a closer point as in Fig. 19. The latter eye is therefore the squinting eye.

I have tried to make this explanation as simple as possible, so that any one of my readers might clearly comprehend.

The squint commonly met with in children is therefore due to lack of harmony between the action of the ciliary muscle within the eye and the internal recti without.

Not due to a curl hanging over the child's forehead, not due to a tassel hanging from the baby's pram cover, not due to worms, not due to fright, and not due to naughty imitation of another squinting child. Surely if the women of the East End of London can appreciate that the squint is due to lack of glasses, how much more the educated general practitioner.

It is true that a squint is often noticed for the first time say, after an attack of measles or other febrile disturbance. Such a little patient has just been able by means of good muscle tone to exert accommodation in excess of convergence, but the loss of muscle tone consequent on the illness will allow this squint suddenly to appear. The child can no longer keep up the fight.

In every centre for child-welfare it should be taught that a squinting child over the age of six months should be seen by an oculist. The eyes of a baby have not settled down

to complete concomitant action until three months old. Several intelligent mothers have brought their five months old babies showing a decided squint. In each case, having examined the refraction under Atropine, one was able to prescribe little spectacles, the sides of which were tied round the baby's head with tape. These babies have become so used to the glasses that they cry if they are not put on soon after waking.

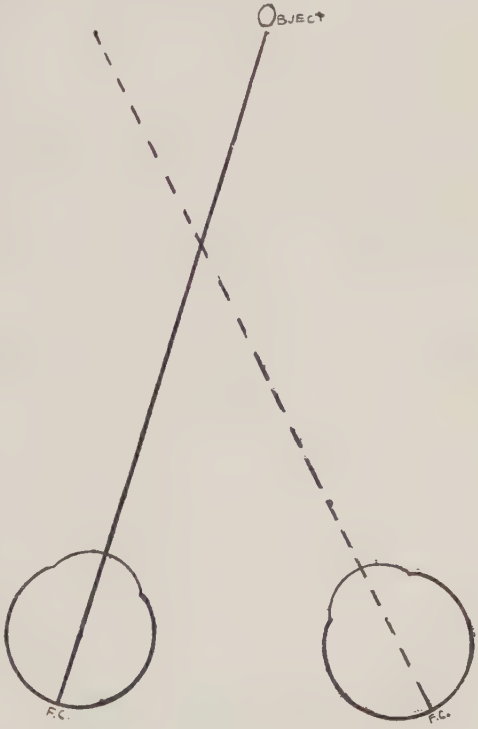

Fig. 19.—Abnormal Convergence.

Can a child grow out of a squint without the use of glasses? Yes, it is possible, and occurs in a great many cases, but at what a cost! Let me illustrate by reciting the following case. A boy aged 14, the son of a professional man, was brought by his mother. Both eyes were quite straight, but the vision of one eye was very poor indeed. I examined this eye and found it to be perfectly healthy. When I asked the mother had the boy ever squinted she told me he had, but as the doctor told her he would grow out of it, glasses were never prescribed. The images formed in the squinting eye were disregarded by the brain, so that the faculty of finer sight in this eye was lost. It is almost useless to attempt the re-education of the squinting eye after 7

years of age. Worth, in his admirable book on "Squint," has proved this, and it is the common experience of every oculist. Once only can I remember having improved by two lines a little patient's vision, who was 9 years of age. The good eye was completely occluded for months.

A squinting eye becomes an amblyopic eye, and remains so throughout life whether the squint disappears by itself or by an operation.

Will glasses then cure every case of squint ? The writer has seen many little children from 1 to 3 years of age whose eyes became perfectly straight after the use of correcting glasses in three months' time, but in spite of glasses a certain number will continue squinting. In the latter class two factors are concerned. The first factor is somewhat problematical. The brain has not acquired the power of fusing two images into one. Stereoscopic vision is impossible. The second reason is an absolute one, and invariably discovered at the time of operation. The power of the internal rectus in virtue of its size and strength far exceeds that of the external rectus: the latter muscle is often a mere ribbon. At these operations I constantly demonstrate to those looking on the great inequality of these two muscles. No muscle training that has ever been devised could change the condition commonly found.

For how long, in this latter class, should glasses be tried. Sometimes I do not wait more than a year, and in others two years.

It is the happy experience of many oculists to find that when they have straightened the squinting eye the little patient at once begins to develop his fusion faculty. The stereoscopic vision begins to be appreciated and in that test with which so many are familiar "the bird flies into the cage."

A much less common form of squint, the divergent variety, is usually associated with the opposite condition of refraction, i.e. myopia or short sight.

In the operation for squint, no longer is the internal rectus merely cut through or tenotomised with the fervent

hope that the eye will be found straight on removing the bandages: such an operation is neither logical nor surgical. When the orthopædic surgeon tenotomises a muscle and reattaches it full physiological action will follow, so the ophthalmic surgeon has found that after the internal rectus is divided a suture must be passed through the cut end and loosely attached to the old insertion. This provides a check on the movement and action of the tenotomised muscle, at the same time the external rectus muscle is advanced the requisite amount to rotate the eyeball outwards. If the eyeball has been rotated outwards beyond the middle line, then the check suture can be brought into play and the eyeball brought back to the middle line so that the visual axes will be parallel.

CHAPTER XI

INJURIES TO THE EYE

When describing some of the injuries to the eye one thinks of several cases which have been seen recently. These were cases in which the eye had received a blow, two of them by the knuckle while fighting. In both these cases there was a great deal of pain and redness of the eye, but the eyes were intact and there was no sign of blood in the anterior chamber. Whilst looking at the eye of the first with an ophthalmoscope 18 inches away I could see when the patient directed his gaze slightly downwards a crescentic-shaped substance which I knew to be the edge of the dislocated lens. The lens indeed had been driven downwards into the vitreous.

In the second case there was no lens to be seen, while the fundus could be clearly seen with an ophthalmoscope. It was only the shaking of the iris in its whole circumference that indicated that the lens was lying at the bottom of the vitreous.

What happens in such cases if they are left alone ? The text-books tell us that either irido-cyclitis or glaucoma follows.

The pressure of the edge of the lens on the back of the iris and ciliary body readily produces irido-cyclitis, so that if the lens is but partially dislocated, known as subluxation of the lens, this condition may be expected, and this eventually may lead to sympathetic ophthalmia. As both of these cases which I have just mentioned showed complete dislocation of the lens, glaucoma such as I had expected supervened. I did not wait until the vision was destroyed, but using my own cataract knife, which is much smaller than the ordinary

Graefe, I transfixed the cornea, cutting out as in an ordinary cataract operation, keeping all pressure of the eyelids from off the eyeball. I knew vitreous would escape and was therefore prepared for it, but in the first case as soon as I had opened the eye the lens was forced up by the vitreous into the anterior chamber, and I carefully removed the lens with a vectis with but the loss of a drop of vitreous. The resulting vision in this eye was 6/12.

In the second case the lens did not present itself, so carefully slipping the vectis down to the bottom of the vitreous chamber by touch I recognised I was in contact with the lens and brought it to the wound; just at this point the patient lost his nerve and squeezed viciously, half of his vitreous was lost, and yet he now has a very good eye.

A third case of dislocation of the lens was produced by a blow from a squash racquet. When the patient was first seen the anterior chamber was full of blood. He was placed in a nursing home and the eye carefully watched. Three days later the blood had become absorbed, so that when oblique illumination was used I could see the golden rim of the edge of the dislocated lens. The lens had been dislocated forwards through the pupil into the anterior chamber. On the fifth day after the injury the lens was removed with a minimum loss of vitreous, the resulting field of vision was good, but owing to destruction of the macula by concussion central vision is very poor indeed.

Observe then, in all cases of blows on the eye, whether or not the iris appears to shake either in whole or in part. Normally the iris is kept steady in position through being in contact with the anterior surface of the lens.

Should a hæmorrhage occur into the vitreous as a result of a blow on the eyeball, the blood may become rapidly absorbed and but few opacities remain.

In a street fight a man was struck a blow on the eye with a pair of heavy pliers. Later the blood became absorbed from the anterior chamber. The iris was seen to be almost completely detached from its root and nothing but a long

slit-like pupil remained. The light from the ophthalmoscope was reflected from the fundus back through a large round pupil containing in its centre this slit-shaped aperture. The lens was not dislocated. I watched this eye for many months and neither irido-cyclitis nor glaucoma supervened.

Suppose as a result of a blow rupture of the sclera takes place and the lens escapes beneath the conjunctiva, it might appear natural to some to open the conjunctiva and allow the lens to escape, but this would be entirely wrong. By allowing the conjunctiva to remain intact the sclera will heal, vitreous will not be lost and the dislocated lens lying beneath the conjunctiva will become absorbed.

The commonest injury of the eye met with by the general practitioner is that of a foreign body embedded in the cornea. So often these small particles consist of coal dust, emery, or steel filings, which if they protrude slightly upon the surface of the cornea produce intense pain on winking. These small bodies are often infected, so that when the eyelid is rubbed conjunctivitis will follow. It is quite easy to miss a foreign body embedded in the centre portion of the cornea when the pupil forms the background, and so the wise doctor when examining a cornea with the naked eye will not alone look straight into the patient's eye, but will direct him to look upwards and downwards and from side to side. A small black foreign body shows up readily when a grey iris forms the background. To remove such a foreign body a few drops of 5 per cent. Cocaine should be instilled into the conjunctival sac, and by means of a spud (Fig. 20), not a needle (Fig. 21), while the lids are held apart by the first and second fingers of the left hand the doctor standing slightly to the right or behind the patient, removes the foreign body by levering it from its position. A scraping movement should be avoided, as the intention should be to avoid further damage to the surrounding corneal epithelium.

If the injury has occurred on that or the previous day, by washing out the eye with a lotion and applying a little Boracic ointment, the eye afterwards being bandaged, healing may take place in a few days. If Atropine is instilled

the workman may not be able to do his work for 7 or 10 days; so that one avoids Atropine if the wound appears not to be contaminated, but should the foreign body have been present some time and the cornea immediately surrounding the foreign body appear hazy, then the removal of the foreign body should be followed by the use of Atropine ointment 1 per cent., combined with a little Boracic ointment 10 per cent.; this should be used thrice daily. In elderly patients care must be taken that Atropine shall not produce the onset of glaucoma. Unfortunately the author has seen two such cases.

Fig. 20. Corneal Spud.

Should a patient with redness of the eye go to a doctor complaining of pain and the eye be carefully examined and no foreign body found, do not come to the conclusion that this is a case of mild conjunctivitis; the pain is out of all proportion to the redness of the eye. What should be done? Take a small piece of cotton-wool wound on the end of a match, ask the patient to look down and, gently everting the upper lid, there you will find the small offending foreign body lying on the surface of the lid, which can be easily wiped away without Cocaine; there is then immediate relief.

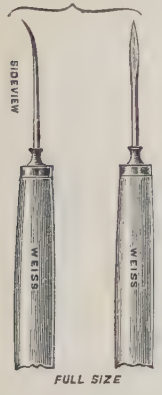

Fig. 21.—Walton's Foreign Body Needle.

It is interesting to know that one patient carried a piece of a rose tree the size of a clove beneath the upper eyelid in the superior fornix from August to November; it was only when the purulent discharge became profuse that she sought assistance. The piece of wood had produced a groove on the eyeball, yet the patient had not complained of excessive pain. One special care, therefore, in examination of the eye is not to omit everting the eyelids and examining the conjunctival surface.

Another common form of injury to the eye, and generally seen first by the doctor, is a burn produced by hot water, molten metal, or caustics in chemical works. Strong alkalies and acids produce severe burns. When looking at the eye the cornea may appear quite clear, but if one drop of Fluorescein or Bengal Red be instilled it is seen that the cornea has been denuded entirely of its epithelium. Such an eye should be carefully watched and carefully treated. To neutralise, the eye should be gently washed out with either weak alkalies, such as Lotio Sod. Bicarb. 3 per cent., or weak acids, as Lotio Ac. Boric. or milk. If there are solid particles of lime present these should be picked out with forceps, and the eye washed out with Boric lotion or 10 per cent. neutral Ammonium Tartrate, and a few drops of castor or olive-oil instilled. As the conjunctiva may be severely injured a glass rod laden with sufficient Boracic ointment should be swept round beneath the lids to prevent adhesions forming, and should symblepharon still threaten, the glass rod should be used daily, as prevention of this condition is indeed much easier than cure. Abramovicz in the *British Journal of Ophthalmology* remarks that ammonia burns of the eye are always serious. Ammonia absorbs water and dissolves albumin, this tends to destroy the corneal epithelium and Bowman's membrane. Prognosis in such cases should be very guarded.

Although it does not fall to the lot of the general practitioner to treat eyes which have been perforated, he should know what course to follow when such a case comes under his care. This recent example is illuminating. Just before midnight I was rung up by a doctor who requested me to see a patient who on going to bed, and while still in the dark, stooped down to pick up her slippers. She wore pince-nez. She did not realise she was standing close to the foot of the bed, and as she stooped she struck her face violently against the wooden rail. At once there was severe pain ; she realised that the smashed lens of her glasses had injured one eye. The doctor could have applied a bandage and put the patient to bed and perhaps given morphia, but instead he

wisely decided to ring up about the case. She was brought at once in a car, and when the eye was examined it was found that a large loose "V" shaped flap had been cut out of the cornea. The apex was opposite the middle of the pupil. She was placed at once on the operating table, and under sterilised cocaine the wound was gently searched for broken glass: none could be found. The conjunctiva was carefully dissected up from around the limbus and slipped over the cornea; this proceeding pushed the "V" shaped flap back into position, so that in a few days the cornea was completely healed with two thin grey lines as scars. But now it was observed that the capsule of the lens and the iris had been injured; the lens growing opaque was gradually extruding itself into the anterior chamber, so on the eighth day after the accident to prevent the onset of glaucoma the upper half of the cornea on the limbus was incised by the use of the cataract knife, the soft lens matter was gently evacuated and the iris replaced. The eye healed by first intention, there is quite a good deal of vision left and the eye does not show any deformity. I would refer those of my readers who are particularly interested in the repair of injured eyes to an article in the *Proceedings of the Royal Society of Medicine*, 1926, Vol. XIX, Section of Ophthalmology, where I have illustrated the *modus operandi* of such grafting operations. It has been mentioned that the non-vascular cornea can be aided in its healing by gently slipping the conjunctiva over its surface. As a rule when healing has taken place the conjunctiva by virtue of its own elasticity withdraws itself. But perchance should it remain adherent it is not at all difficult to separate it by means of fine scissors, and nature will soon reduce what is left to the thinnest scar possible.

A perforated eye should therefore not be considered lost, but the operation just referred to should be performed before there is a chance of infection overtaking the wound.

Think of the wisdom of the doctor who at midnight did not delay in sending his patient for attention.

The illustration which accompanied the article referred to

in the *Proceedings of the Royal Society of Medicine*, has been reproduced (see Plate IV). Briefly the description of the operation is as follows: The lids are held apart from off the eyeball so that there is no pressure applied. Ragged epithelium from the edge of the wound is removed. The conjunctiva is dissected up half-way around the limbus of the cornea, while a horizontal incision is made several millimetres below the cornea so as to allow the flap of conjunctiva to be drawn upwards over the injured area. The flap is held in position by two sutures as shown in Plate IV, Fig. 1. Eight to ten days later the conjunctiva will be found adherent to the wound and filling up the area of lost substance, and the remainder of the conjunctival flap by virtue of its elastic tissue is withdrawing itself from the surface of the cornea shown in Plate IV, Fig. 2. By passing a lacrimal probe beneath the flap and using scissors, the unattached portion of the flap is cut away, and now it will be seen that the little conjunctival graft is being fed by new blood-vessels passing to it through the substance of the cornea. The surface of the graft, although raised above the surface of the cornea, should not be trimmed, but the action of the eyelids smooths down the surface and gradually the deep vessels shown in Plate IV, Fig. 3, shrink and the final result is shown in Plate IV, Fig. 4. These four illustrations were taken from a boy who suffered from a perforating phlyctenular ulcer. This operation is of use in:

(1) Traumatic cases: I have seen a wound of 15 mm. involving cornea and sclera healed by this method.

(2) Perforating phlyctenular ulcers.

(3) Perforating septic ulcers: a good result is much more common than failure.

PLATE IV

FIG. 1.—Conjunctiva sewn over corneal wound.

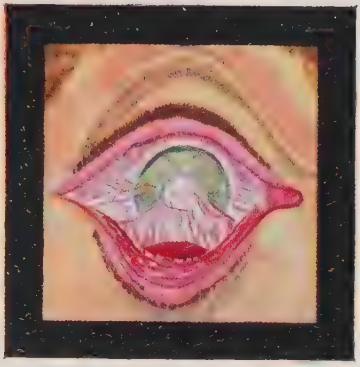

FIG. 2. — Eight days later. Sutures have cut out.

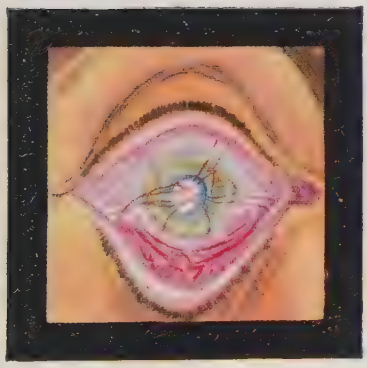

FIG. 3.—Conjunctival graft in place with new blood-supply.

FIG. 4.—Final result.

[*R. Lindsay Rea.*

PLASTIC REPAIR OF PERFORATION OF CORNEA.

CHAPTER XII

CATARACT

If the reader will glance for a moment at the accompanying diagram, Fig. 22, and observe the position of the lens situated behind the iris, he will understand immediately that if this lens, which is normally transparent, should for any cause lose its transparency, then light cannot pass through the pupil to the retina. The opaque lens will interfere with the passage of light. In other words, there is a cataract present.

So it will be seen that dense corneal scars which the layman sometimes terms cataract have nothing whatever to do with this condition. If there is a dense scar in the middle of the cornea, and it is known that the lens is perfectly clear, then an operation, iridectomy or the removal of a piece of iris, will allow light to pass uninterruptedly to the retina, and so a blind person may be made to see. A few weeks ago such an operation was done on a patient's eye. This eye had not been used for forty years, but now he sees sufficiently well to get through the traffic of London safely. But this has nothing to do with cataract, beyond the fact of emphasising that cataract is nothing else than an opaque lens.

Lamellar Cataract

The first type of cataract which will be discussed is that known as lamellar cataract. This type of cataract is seen in young people. The whole lens is not opaque, but if the eye is examined through the mirror of an ophthalmoscope held 16 inches away, the pupil being dilated, immediately within the pupillary margin there will be seen a clear red reflex, and within this an area which reflects the light of

the mirror and has a background more or less red according to its density (Fig. 23).

What has produced this cataract? Most probably it

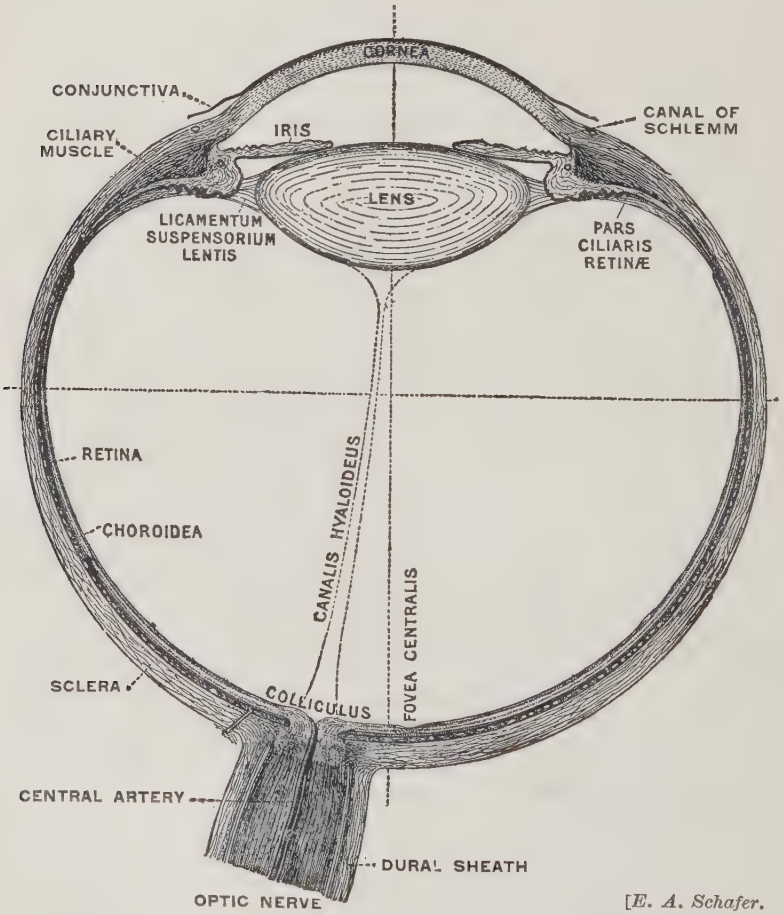

Fig. 22.—Diagram of Section through the Eye.

was not present at birth, but during the first few years of life there has been a period of malnutrition which has affected such parts of the body, the enamel of the teeth for instance which has its development from the epiblast of the embryo. The teeth show defective enamel; these eroded teeth may

show transverse markings on them. It will be remembered that the lens of the eye is also developed from the epiblast, and as only those teeth whose enamel germs were being formed at the same time are affected, so we connect the two things in general: when the lamellar cataract is found we look for defective incisor teeth.

The treatment for such cataract depends upon its density. If the vision obtainable is 6/12 or 6/18, and the child can just read, which means accommodation is present, this is better than doubtful vision after a cataract extraction with accommodation absent. If the vision is poorer than 6/18 then iridectomy can be done so as to allow light to pass between the edge of the cataract and the periphery of the lens. Such sight, however, can never be better than 6/12.

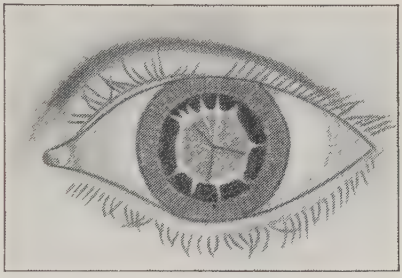

Fig. 23.—Lamellar Cataract as seen by Oblique Illumination.

Congenital Cataract

Occasionally children are born with congenital cataract. Instead of the pupil being black, the pupillary area is more or less white. The only hope of restoring vision to such a child is to have a needling operation performed as soon as possible.

The reader is warned of another condition which produces a white or yellowish pupil in infants, it is that condition known as glioma of the retina. It is frequently congenital. It usually affects both eyes and pursues a course similar to intra-ocular sarcoma.

Glioma kills by metastases of the cranial and other bones, also by extension to the brain.

Occasionally the fibro-vascular sheath, which is present at the back of the lens in the fœtus and which is supplied by blood from the hyaloid artery passing through the vitreous in what is known as the Canal of Stilling, persists; this too

produces a white pupil; while yet it must be remembered that a large tuberculous mass growing forward from the retina has the same appearance.

Therefore, should a general practitioner see a baby with more or less white pupils he should think of:

1. Congenital cataract.
2. Glioma.
3. Persistent fibro-vascular sheath.
4. Tubercle.

A formidable list which should at once enlist the help of the specialist.

Senile Cataract

The most usual type of cataract seen either by a general practitioner or an oculist is what is known as senile cataract. As the normal lens grows older there is a slowly progressive increase in optical density. The lens absorbs light in such a way that if the narrow slit-like beam of light from a slit lamp is thrown into the eye the lens appears to be tinted yellow. As this density increases the reflected light becomes more yellowish, tending towards a brown colour. The reflection from the ophthalmoscope may show nothing but a dull red reflex, and the vision may be poor indeed. To this type of cataract the term "Brown" is given. It may be extracted while the vision is still 1/60 and the lens is usually delivered complete at the operation.

Of senile cataract the commonest is that which shows radial spokes or sectors growing in from the periphery of the lens. With the ophthalmoscope the red reflex of the pupil is interrupted by these spokes, the lens substance between the spokes being so clear that vision may still remain at 6/6. If the pupillary area is occupied by these cataractous opacities (see Fig. 24, which represents the reflection from the pupil in a case of senile cataract with radial spokes), and not alone the length but the width of these radial spokes increase, and the lens ultimately becomes uniformly opaque and sight is reduced to

counting fingers at 8 inches, then it may be said the cataract is ripe for operation.

It is a fortunate thing that both lenses do not usually become completely cataractous simultaneously. One cataract may be ripe while the other eye may still see 6/18 or even 6/12.

What are the metabolic processes underlying cataractous changes of the lens ? A great deal of work has been done lately on this subject, and certain factors have been elucidated. The lens proteins are four in number ("Jess"): albumoid, which is a water-soluble protein found in the nucleus of the lens; two water-soluble crystallines found in the cortex; and a small quantity of albumin. As we grow older the insoluble albumoid increases, and the soluble crystallines decrease. The formation of opacities in the lens is therefore a coagulation of the proteins. Its coagulation is brought about by any form of radiant energy, heat, light, and ultra-violet light, also radium. In addition mechanical shock will produce these opacities. After a certain amount of exposure to ultra-violet light the proteins are more easily coagulated by other influences, such as changes in the salt concentration of the body fluids.

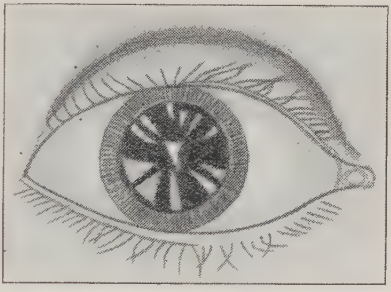

Fig. 24.—Senile Cataract seen by Reflected Light.

Clinically we know that toxic changes will produce cataract. The writer has seen a young lady 25 years of age suffering from a toxic neuritis in the body while at the same time developing cataractous changes in one eye.

The nutrition of the lens, which is entirely avascular, is governed by the efficiency of the capsule, which is a semi-permeable membrane and can be interfered with; for example, when the eye is radiated with thermal or abiotic

radiation, or when its vitality is lowered by disease, or its continuity is broken by trauma. One sees so many patients employed as cooks suffering from early cataract that one is forced to believe that the heat radiating from the fire is the direct cause of the lens opacities. In accidents where the eye has been perforated and the lens capsule opened, cataract is seen to supervene rapidly.

There is constant osmotic action between the aqueous humour in the anterior chamber and the lens substances, the osmotic action taking place through the lens capsule.

In diabetes, where sugar is present in the serum, fluid tends to enter the lens. The lens becomes slightly swollen so that the patient becomes somewhat myopic or short-sighted, but this abnormal osmotic action will eventually lead to opacities forming in the lens so that following this diabetic myopia there will be true diabetic cataract. If the diabetes can be controlled the progress of the cataractous changes may be retarded, but if opacities have formed by the changing of the proteins of the lens, these opacities will not diminish, and one can easily understand that the cataract cannot be cured. If vacuoles have formed in the lens in the early stages of diabetes, such can be removed if the faulty osmosis can be corrected, and in some conditions of injury to the lens, by the removal of these vacuoles cataractous opacities will clear up.

In the past various medicines have been prescribed for the cure of cataract, and naturally people who dread a cataract operation will willingly try such specious medicines recommended by quacks. The writer has seen ripe cataracts which have had every form of known treatment applied without having derived the slightest benefit. One patient who came with double cataract had used patent drops for six years ; when seen both cataracts were passing into over-maturity. There is at least one substance which seems to have had some degree of success : this is a compound consisting of Calcium, Sodium, and Iodine, which has been tried first in France, and of which a good report is

heard. One still waits to see the result of such treatment, for obviously correct deductions can be come to only when a large number of cases have been examined.

In no place do we find such nonsense spoken of regarding cataract as in books containing faith-healing teaching. One of the latest published is a disgrace to any person attempting to teach the lay mind.

In a previous chapter, and in this one, I emphatically assert that delay in many cases means irretrievable blindness. Those who write books on faith-healing are indeed responsible for a great deal of suffering and misery.

When should a cataract be operated upon ? If a cataract is present in a patient under 21 years of age simple discission is all that is necessary, that is, the discission needle is passed through the capsule of the lens which is freely opened, the lens matter then partially extrudes itself into the anterior chamber and gradually becomes absorbed. In the case of a senile cataract the best operation is that described as the simple cataract operation. It is an operation that involves the least amount of intra-ocular manipulation. When I first operated for cataract, using a Graefe knife, several times I had to use a knife that had been sharpened more than once, and so had a greatly reduced blade; the results obtained with such a knife led me to ask Messrs. Weiss of Oxford Street to manufacture a special knife for me. It is stronger than Herberts knife and much narrower in the blade than an ordinary Graefe (see Fig. 3, p. 3). With this knife the cornea is transfixed, and on its passage through the anterior chamber by means of the point of the knife the capsule of the lens is opened from six o'clock to twelve. As the knife cuts out at the limbus the widely dilated iris is seen to slip behind the knife's edge, so that when the cataract is delivered, the iris is replaced without being touched by any instrument whatever by merely smoothing the corneal surface, and the round pupil is reformed.

It is delightful to find in many of these cases where double cataracts have been removed that the vision in each

eye is not alone 6/6 but that binocular vision is once more regained.

There are times when an iridectomy must be done. One avoids if possible delivering the lens in its capsule: such an operation is not suitable for European eyes. Once again may it be repeated that my operation of choice, and I can heartily recommend it to others, is that known as the Simple Cataract operation done with one instrument only, a fine cataract knife such as has been described above.

CHAPTER XIII

EXAMINATION OF THE EYE IN DISEASES OF THE NERVOUS SYSTEM

During the past few years, and while on the staff of the West End Hospital for Nervous Diseases, I have been greatly struck by the number of general practitioners who attend the Post-Graduate Lectures at this hospital. These men in general practice I discovered were exceedingly keen to keep their knowledge fresh and avoid being stale at their work. The majority of them showed the keenest interest in the lectures, and so I have determined to include in these chapters the description of the methods of examining the eye in nervous diseases, and also the ocular manifestations of the commoner diseases of the nervous system.

Equipment

I would suggest the practitioner should equip himself with the following instruments :

(*a*) A 13-dioptre lens 2 inches in diameter in a spectacle mount (see Fig. 25). This magnifying glass is of the greatest use for throwing light on the eye to observe the condition of the cornea : many foreign bodies in the cornea are missed by the omission of the use of such a lens ; also it is used to observe pupillary reflexes.

When light is focused on the eye by means of this lens the pupil contracts : this is known as the direct light reflex. As the light is thrown on one eye, and if the pupil of the other eye be observed it will be seen to contract also, this is known as the consensual light reflex. Without throwing light into the eye, if the patient directs his gaze to a point say 8 inches away, again the pupils will be seen to contract. This

contraction of the pupils occurs simultaneously with the act of accommodation. What then is the Argyll-Robertson pupil? When such a condition is present and light is thrown into the eye by means of the magnifying glass the pupils fail to contract, but with the light still concentrated on the eye and the patient is asked to look at a point 8 inches away the pupils will now be seen to contract, there is then absence of reflex to light but the presence of contraction to accommodation. The best method of observing the Argyll-Robertson pupil is to place the patient in a dark room, direct him to look at a point 20 feet away, and either by means of the lens or a small flash-lamp direct the light suddenly on one eye. Looking at a point 20 feet away accommodation will not be exerted and the pupil fails to contract. While keeping the light on the eye the patient is now told to look at a finger 8 inches away from his face, the pupil will be seen to contract. Sometimes the Argyll-Robertson pupil is seen on one side only.

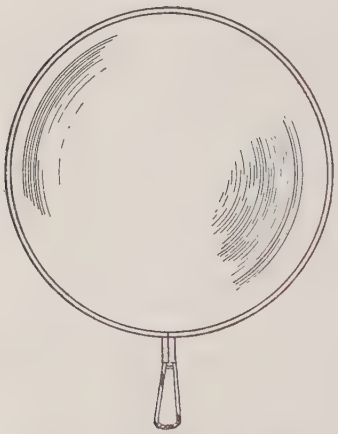

Fig. 25.—13-Dioptre Lens used for Oblique Illumination.

(*b*) The doctor should be in possession of an electric ophthalmoscope, and he should remember that the most expensive will probably be the least useful. The one which I consider invaluable is the small electric ophthalmoscope with a prism reflector, which is infinitely better than a reflecting mirror with a slit. The "May" Electric Ophthalmoscope is the one I prefer (see Fig. 26).

Looking back on one's student days and remembering the length of time it took to learn the use of the ordinary ophthalmoscope, it comes as a revelation to see a student taking this little electric ophthalmoscope and straightway

FIG. 1. [*R. Lindsay Rea.*

FIG. 2. [*R. Lindsay Rea.*

examine a retina practically without any previous instruction. Every doctor should possess one: the battery can be replaced for a few pence, and the same battery can be used in the Ever-ready pocket torch. It is a pleasure to be able to go round a ward in hospital and examine fundi either with or without dilation of the pupils.

With a little practice it is not difficult to learn the appearance of a normal optic disc. The healthy disc may show a cupping in the centre from which the vessels gradually emerge (see Frontispiece). The surface of the disc is a delicate pink, the colour is produced by the presence of minute vessels. In optic atrophy the surface of the disc is white, due to the absence of these minute vessels. If the optic atrophy is primary, as in tabes, the edge of the disc is clearly defined, but if the optic atrophy has followed on an optic neuritis, or as it is better described "papillœdema," the atrophy is then known as secondary and the edge of the disc is blurred and not clearly defined. In secondary optic atrophy if a physiological cup was present originally it is now filled in, and further, owing to the inflammatory condition of the nerve head, the peri-vascular sheaths of the vessels

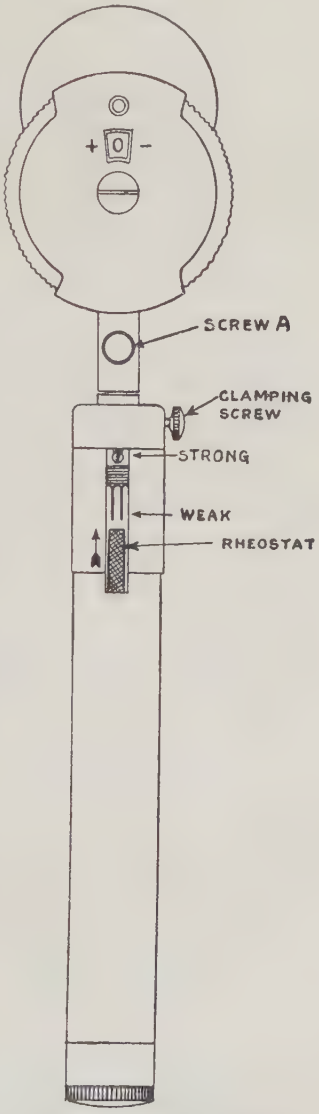

Fig. 26.—"May" Electric Ophthalmoscope.

show fine white lines running along their course from the disc edge.

A papillœdema is recognised by greatly swollen veins, the surface of the disc is red and may even show minute hæmorrhages, while the edge of the disc can scarcely be determined (see Plate V, Fig. 1). The whole nerve-head is pushing forward into the vitreous, mushroom-like.

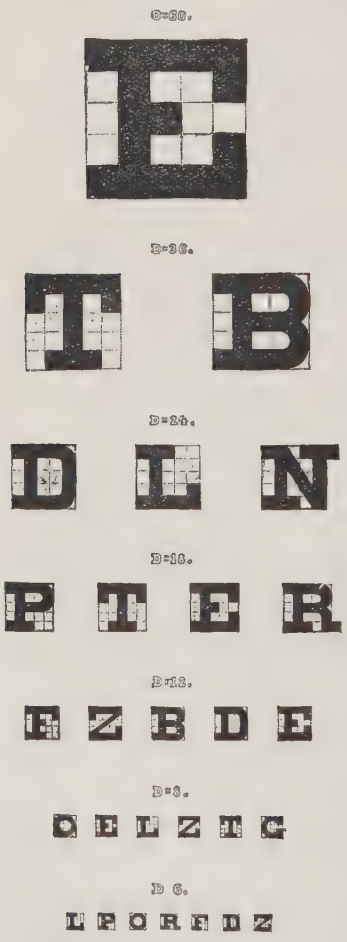

Fig. 27.—Snellen's Test-types.

The stages of a papill-œdema or optic neuritis vary from a slight blurring on one edge of the disc and somewhat swollen veins to an appearance totally unlike an optic disc, the œdematous and hæmorrhagic area into which swollen veins proceed and the half-obscured arteries emerge. To focus the surface with an ophthalmoscope the observer's accommodation being at rest, it will require a lens of three dioptres to see the vessels and the surface of the disc when swollen to the extent of 1 mm.

(*c*) It is almost needless to remind my readers that a "Snellen's" Test-type should be hung in the surgery (Fig. 27). If the room is not 18 feet from wall to wall, or corner to corner, then reversed types can be obtained, so that by looking into a mirror placed 10 feet away the patient can read the test-type situated above his head.

Visual Acuity

Visual acuity is expressed by a fraction, the numerator of which denotes the distance at which the patient is seated from the test-type while the denominator expresses the distance at which the smallest line seen by the patient should be observed by a normal eye. For example, if the patient can see the top letter of the test-types only, this letter should be seen by a normal eye at 60 metres or 180 feet, but the patient is situated only 6 metres or 18 feet away from the test-type, therefore the visual acuity is 6/60.

(*d*) Lastly I would suggest the use of an inexpensive instrument, Bishop Harman's Scotometer with a perimeter arm. It is the cheapest instrument I know by which one can not alone record a patient's visual fields but can also record scotomata or blind areas and can measure an enlarged blind spot, or the area which corresponds to the optic nerve-head.

Pitfalls

In examining eyes one must never forget that there is a blind spot in each eye: it is easily found. On a piece of writing paper held 20 in. away mark a small cross No. 1, also a similar cross No. 2 5 in. away on the right of No. 1. Close the left eye, and with the right look at cross No. 1. Cross No. 2 cannot be seen; its image has fallen on the optic disc. A patient who had already suffered from a detached retina suddenly discovered the blind spot in the other eye; he came with fear and trembling thinking that the retina of the healthy eye was becoming detached also.

While taking a patient's field of vision the patient should not be tired, also it is almost impossible to get a consistent answer from an hysterical patient. Again, an optic disc looks much whiter by contrast in a dark brown eye, therefore before taking the responsibility of declaring the presence of optic atrophy one should need to have had constant practice with the ophthalmoscope. Finally, in young children with hypermetropic eyes the nerves proceeding from

the optic disc to the retina show up so plainly that the mistake of calling such a disc a papillœdema is not infrequent. Sometimes these fibres do not lose their medullary sheath, and show as a flame-shaped white patch resting on the edge of the disc.

The reader should reserve his judgment on any departure from the normal disc until his diagnosis has been confirmed by one whose daily work it is both in hospital and private to appreciate what each small change seen by the ophthalmoscope signifies.

The practitioner should examine as many normal eyes as possible so that when the opportunity arises of examining a primary optic atrophy he will readily recognise the changed condition of the optic disc.

Possibly the two commonest diseases of the nervous system met with in general practice are tabes and disseminated sclerosis. Twenty per cent. of tabetics show optic atrophy. This primary optic atrophy is steadily progressive, the progress being indicated not alone by the whitening of the disc, but by the gradually decreasing field of vision; the field of vision gradually shrinks, until at last the macula is involved and total blindness ensues. Fig. 28 shows a typical contraction of the field of vision in an eye which has suffered from primary optic atrophy for almost a year. Such a patient will often ask, "How long will it be until I am blind?" Although it might be taken that vision will last another year, the two-year rule does not always hold. I am quite certain that by the diligent use of mercurial inunction and potassium iodide loss of vision can be delayed for at least a further twelve months.

It does seem a remarkable coincidence that if primary optic atrophy supervenes the patient does not suffer so severely from motor-paralysis, while in many cases where there is ataxy vision remains perfectly normal for a considerable time. The reason for this is clearly indicated by the pathology of such conditions and not by any mere coincidence.

In disseminated sclerosis probably about 3 per cent.

show complete optic atrophy, also there is an incomplete optic atrophy commonly present. This incomplete optic atrophy can be observed when examining the disc: the outer half of the optic disc, that is the part of the nerve conveying the fibres to the macula and peri-macular region, known as the papillo-macular bundle, is distinctly whiter than the inner half. Text-books vary greatly as to the percentage showing incomplete optic atrophy; some say

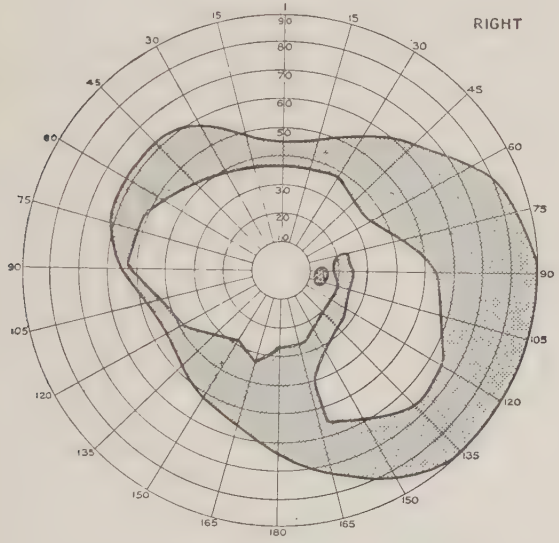

Fig. 28.—Field of Vision in a Case of Tabo-paresis.

37 per cent., but my observations lead me to believe that over 70 per cent. would be nearer the truth. If part of the optic nerve has become atrophied then a corresponding area of the retina will be insensitive so that there will be blind spots or scotomata present. Very rarely is papillœdema seen in disseminated sclerosis.

In hysteria the disc has a normal pink appearance, and if the field of vision is recorded it will vary from day to day, showing that organic disease is not present.

An hysterical patient attending the large out-patient

department of an eye hospital was able to distinguish between two surgeons, the one who was attending her, and the other who was not, across the whole length of the room, while when asked to read the test-type she could not see any of it, and when requested to walk up to the test-type to read the largest letter she not only missed the test-type and the wall on which it was hung, but was stopped from passing through an open door which was beside the test-type. It is only in the case of an hysterical patient that such phenomena could be seen.

Ocular paralyses seen in tabes show the third cranial nerve to be chiefly affected. The patient may suddenly complain of seeing double: this is the first and earliest sign of the onset of paralysis of one branch of the third nerve; this may recover temporarily, and as a rule does not spread to the other branches until a complete third nerve paralysis is found. Think of the anatomy of the third cranial nerve. One observes that the lid is hanging down—ptosis. When the lid is raised the eyeball is seen to be rotated downwards and outwards, and on examination it is found that the external rectus, which is supplied by the sixth cranial nerve and which turns the eyeball outwards, and the superior oblique, supplied by the fourth cranial nerve and which rotates the eyeball downwards and outwards, that can only move the eye. On the other hand, it is less frequently found that the sixth nerve is paralysed, so that when the unopposed action of the healthy third or oculo-motor nerve turns the eye in, there is convergent squint and the lid is unaffected. In disseminated sclerosis a single branch of the nerve is not at all so likely to be affected: associated movements are greatly interfered with, that is, the patient cannot move both eyes in a like manner simultaneously.

Nystagmus or rapid to and fro movement of the eyes is fairly common in disseminated sclerosis. In hysteria paralyses of any kind are not observed.

Pupillary changes seen in tabes vary greatly, the commonest is the Argyll-Robertson pupil. Remember, this means

failure of the pupil to contract to the stimulation of light, but contracts when the patient is endeavouring to look at a near point. Briefly, failure to light, present to accommodation.

Small pupils or miosis is another somewhat common pupillary change in tabes, but should the reader ever observe his guest at dinner to have such pupils do not on any account try to be clever like a consulting physician who informed a patient under similar circumstances that he had such pupils. Sometimes the pupils are slightly irregular, one-and-sixpenny pupils are seen, i.e. one pupil being larger than the other. In advanced disseminated sclerosis miosis is somewhat common. Again in hysteria the pupillary reflexes are normal, the pupil contracting to direct light reflex and the consensual reflex of the other eye is present also. The eyesight in tabes gradually fails due to contraction of the field of vision, but in disseminated sclerosis vision may suddenly fall almost to complete absence and may just as suddenly return. This does not occur in tabes. The results of examination of vision in hysteria are utterly bizarre.

The reader should stop here and carefully reread from the beginning of this chapter, so that he may closely compare the above signs and symptoms with those found in general paralysis of the insane. Primary optic atrophy occurs in 8 per cent. of these cases, and although paralyses of the extra-ocular nerves occur the percentage in general paralysis of the insane is much smaller. Pupillary changes show that 50 per cent. acquire the Argyll-Robertson pupil, others show paradoxical pupils, that is, the pupil is actually seen to dilate when light is thrown into the eye. Mind blindness occurs in these cases, which one would expect, as the brain is chiefly involved in this disease. The extent of contraction of the fields of vision depends upon the extent of optic atrophy present.

In hereditary ataxy ("Friedreich's Disease") the nystagmoid jerks are probably due to the same lack of co-ordination which causes the other ataxic signs of the

disease. True nystagmus is diagnostic of disseminated sclerosis, but nystagmoid jerks are not to be relied upon, as they can be elicited even in the eyes of healthy people, especially when they look to the extreme right or left.

In epilepsy during the normal state, the fundus of the eye is seen to be perfectly normal, although in a few cases the veins of the fundus are found to be somewhat varicose. There is no paralysis in epilepsy, but during the attack the pupillary light reflex is lost.

In myelitis, although there is no direct communication between the cord and the optic nerves, yet the toxin which is attacking one can attack the other simultaneously, so that in a number of cases papillœdema is found, and ultimately complete blindness may ensue. Sometimes, on the other hand, good vision actually results. If the myelitis affects the cervical or upper portion of the cord there may be pupillary changes due to the sympathetic fibres of the iris being affected, resulting in unequally dilated pupils.

Syringomyelia.—When the dorsal and lower cervical portions of the cord are affected there will be pupillary symptoms, the pupils may be unequally dilated, the smaller pupil will react to light, but does not dilate after the installation of Cocaine. Cocaine is an extremely useful drug in determining lesions involving the upper dorsal and cervical portions of the cord. This drug stimulates the sympathetic nerves to the dilatator pupillæ, producing mydriasis, or dilatation of the pupil. In syringomyelia paralyses of the fourth and fifth cranial nerves are seen. Contraction of the fields of vision is found, but this is usually due to the hysterical condition of these patients.

Injuries of the Spinal Cord.—The sequel to railway accidents found in many people is a condition known as spinal traumatic neurasthenia or railway spine. These patients often find difficulty in reading due to a weakness of accommodation. If an hysterical element is added, the fields of vision will become contracted also.

Neurasthenia.—In former times, before the war, this

condition was found commonly enough among children. In these cases the vision may, or may not, be reduced, but they show a contracted field of vision. The war has added to these cases large numbers of ex-soldiers. The same symmetrically contracted field is found.

I may remind my readers regarding paralysis of the ocular nerves to inquire from the patient or from the patient's relatives when squint was first noticed. An eye may really have shown squint in childhood, the eyes may have become quite straight, but there is a hidden squint as manifested by examining the muscle balance with a Maddox rod.

Regarding the appearance of optic discs or pupillary changes, never try to examine such in an artificial eye.

CHAPTER XIV

LOCALISING VALUE OF EYE SYMPTOMS IN THE DIAGNOSIS OF DISEASES OF THE BRAIN

The examination of the eye aids us greatly in localising the seat of neoplasms in the brain.

As heretofore I will refresh my reader's memory by a brief reference to the anatomy of the middle portion of the brain, tumours of which usually involve some of the nerves connected with the eye. Fig. 29 shows the front view of the medulla, pons, and the mid-brain, the latter consisting mainly of the crura-cerebri, which will be seen to resemble two large rope-like strands emerging together from the upper portion of the pons varolii diverging as they proceed upwards to enter the cerebrum. At the point where each crus disappears into the corresponding side of the hemisphere it is embraced on its outer side by the optic tract. From the inter-peduncular space emerge the third cranial or oculo-motor nerves; this little space is therefore called the sulcus oculo-motorius. Winding around the outer side of each crus is seen the fourth cranial or trochlear nerve. From the ventro-lateral surface of the pons the fifth cranial or trigeminal nerve is seen to proceed, while from the area between the lower part of the pons and the upper part of the medulla the sixth, seventh, and eighth cranial nerves are found emerging closely together. Therefore it will be observed if a tumour or hæmorrhage implicates one nucleus most probably the other will also be affected.

The fibres of the pyramidal tract, which in the pons form scattered bundles, are gradually gathered together and cross over at the lower part of the pons and upper part of the medulla to the opposite side; this is known as decussation

of the pyramidal fibres, a lesion therefore affecting these pyramidal fibres on the upper part of the right side of the

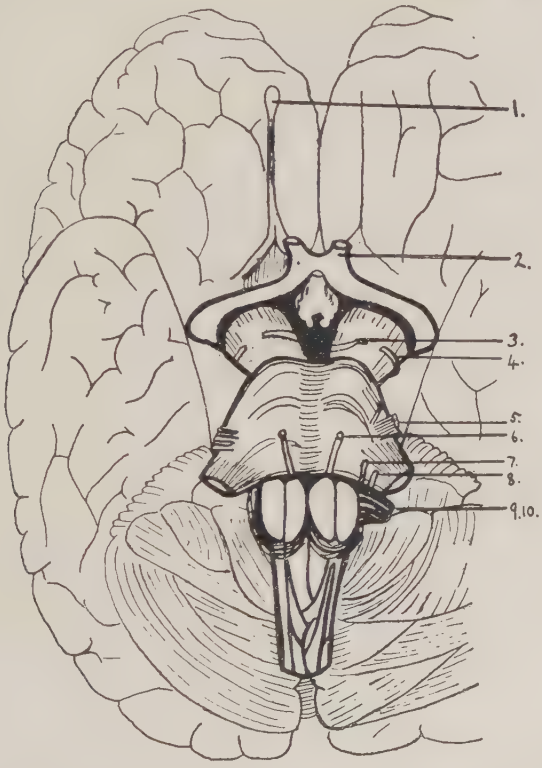

Fig. 29.—The Base of the Brain with Cranial Nerves attached.

1. Olfactory Bulb.
2. Optic chiasma (with pituitary body lying behind) formed by union of optic nerves in front and giving off optic tracts behind.
3. Third or Oculo-motor nerve.
4. Fourth (Patheticus) nerve.
5. Fifth (Trigeminal) nerve coming from side of pons.
6. Sixth nerve.
7. Seventh (Facial) nerve.
8. Eighth (Auditory) nerve.

9 and 10. Vagus and Glosso-pharyngeal nerves. Eleventh and Twelfth nerves not shown. Third and Fourth nerves are winding round the crus cerebri. Sixth, Seventh, and Eighth are emerging from between pons and medulla.

pons will produce a paralysis on the left side of the body and vice versa.

Looking at the illustration it is evident that a lesion

which affects the nucleus of the third, sixth, seventh, or eighth nerves will most probably also affect the pyramidal bundles in their neighbourhood, so that there will be not only a squint produced, but there will be paralysis of the limbs or of the face and limbs as well.

(1) There are several syndromes worth remembering: the first is known as "Weber's" Syndrome, which is a paralysis of the third nerve together with a hemiplegia of the opposite side; there will also be some paralysis of the face and tongue. Where would be the situation of such a lesion? A glance at the illustration shows that such a lesion will be situated at the junction of the pons and crura or mid-brain.

(2) "Benedikt's" Syndrome.—This is a paralysis of the third nerve together with tremor of opposite limbs. It is a lesion of the red nucleus which is situated at the upper part of the mid-brain, the part which receives the fibres from the superior cerebellar peduncle.

(3) "Millard Gubler's" Syndrome.—This is a lesion in the lower part of the pons, producing a paralysis of the face and of the opposite limbs. The eyes are not affected, as the nucleus of the sixth nerve escapes damage.

(4) "Foville's" Syndrome.—The sixth nerve nucleus is involved, so that there is a paralysis of the external rectus of that side. Supposing it to be the right side, the right eye will converge, as the internal rectus will be unopposed by the paralysed external rectus, therefore the right eye cannot turn to the right, and this is expressed as loss of conjugate movement to the right. The seventh cranial nerve is involved, so that there is paralysis of the same side of the face, and there will be a hemiplegia of the limbs on the opposite side.

(5) "Cerebello-Pontine" Syndrome.—Examination at a recent autopsy showed the cerebello-pontine tumour pushing its way along the eighth cranial or auditory nerve and gradually invading the internal auditory meatus; its progress had practically severed the sixth, seventh, and eighth nerves. It had pushed the cerebellum aside. The symptoms of such a condition then are as follows: paralysis

of the sixth nerve supplying the external rectus allows the eye on that side to squint inwards, the seventh nerve is paralysed, that side of the face will therefore be immobile, while on account of the destruction of the eighth cranial nerve there is deafness on the same side. There will be pressure on the cerebellum, producing nystagmus together with a coarse inco-ordination of movements.

Winding around the outer side of the crus is seen the fourth nerve, a thin, fine structure. This comes from the region of the corpora quadrigemina, so that if this part is the seat of the lesion there will be loss of up and down head movements, together with a diplopia produced by paralysis of the superior oblique.

In order to show the optic tracts in the illustration the temporal lobes have been pulled apart. Tumours in this region may press on the optic tracts; they produce loss of visual field, and sometimes one half of the entire field is obliterated. This is known as a complete hemianopia. Jackson described uncinates attacks or dreamy states in such cases—sometimes there are visual hallucinations, together with generalised convulsions; these form a complete symptom-complex of temporal lobe tumours. A tumour situated in the frontal lobe may not produce optic neuritis, or as it is now called papillœdema (" Paton "), but if the tumour affects the cerebellum the papillœdema is intense, therefore we cannot always find the three cardinal symptoms of tumours of the brain present. These are:

1. Optic neuritis, or, as it is now called, Papillœdema.
2. Sickness.
3. Headache.

The diagram Fig. 30 is taken from a brain which the author recently examined. It shows the presence of a tumour the size of a tangerine orange at the base of the brain intimately associated but not forming part of the pituitary gland. The patient, a man aged 51, came on February 5th, 1925, complaining of blindness of the right eye. The history was that the sight of the eye had failed somewhat suddenly just before Christmas. On examining

the eyes nothing abnormal could be found except that the edge of the right disc appeared very slightly blurred. Although the edge was not quite sharply defined there was not a definite papillœdema present, the eye was quite

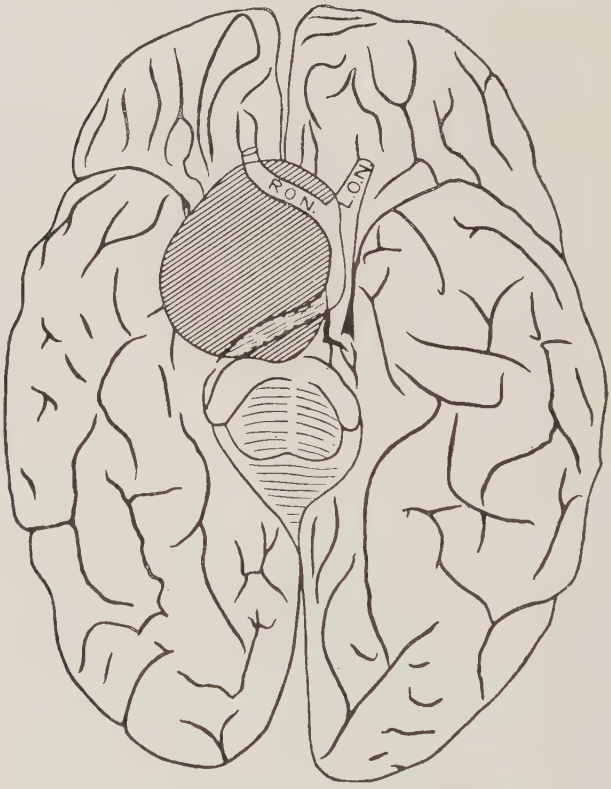

Fig. 30.—Tumour of the Base of the Brain.

R.O.N. Right optic nerve, stretched and flattened, is pushed over to the left side by the tumour.
L.O.N. Left optic nerve.

blind, the central vision in the left eye was normal, and its field of vision was normal also. There was no change in the appearance of the vessels that would suggest a cause for the failure of vision in the right eye. The Wassermann reaction of the blood-serum was negative. The examinations by the rhinologist and neurologist were negative

also. On March 9th the right disc appeared slightly pale. The general health was perfect, and each day his usual work was done. Then for the first time on May 11th I noticed slight blurring of the left disc, and three days later there was a definite papillœdema in the left eye. Suspecting its cause, the patient was then transferred to the West End Hospital for Nervous Diseases. A radiogram was taken which showed at the base of the skull a very much flattened sella turcica (see Fig. 31, which is the actual drawing of the bone). The shadow of the pinna of the ear caused some confusion, making it appear to the physician as if a partly

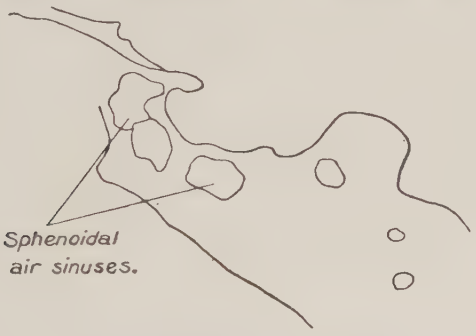

Fig. 31.—Drawing from Radiogram of Base of Skull.

Showing enlarged Pituitary Fossa caused by growth of tumour shown in Fig. 30.

ossified tumour occupied this region, but such an appearance I had often seen in the radiograms of wounded soldiers in France. A decompression operation was performed, but the patient died two days later from meningitis extending from the base of the brain. The post-mortem examination, including that of the brain, was made by Dr. Carnegie Dickson. The actual specimen shows a large tumour, 40 mm. across, occupying the pituitary region. On sectioning, it was found to be an endothelioma intimately connected with the wall of the cavernous sinus. The tumour had flattened out the fossa. Extending upwards on the outer side of the right optic tract, it had pushed the tract across to the left side. The right optic tract and

optic nerve were stretched and flattened by the pressure of the tumour, hence the blindness of the right eye. The left optic nerve and tract were not stretched nor pressed upon by the tumour. Not only was it pressing on the right optic nerve, but it pressed against the right optic foramen, so that there was not the slightest possibility of cerebro-spinal fluid passing down the sheath of the right optic nerve to the eye, hence the absence of papillœdema. It was only when the tumour continued growing and the intra-cranial pressure increased that papillœdema was found in the left eye. The entire absence of symptoms suggestive of cerebral lesion was remarkable. The patient sang a solo in church on the Sunday before his admission to hospital.

Many surgeons, including the late Sir Victor Horsley, have believed that the optic neuritis, by its earlier appearance or greater severity on one side, is diagnostic of the side on which the tumour is. But this sign is of much greater value in the case of intra-cranial abscess. There may be papillœdema on the side of the abscess only. Partial paralysis of the third nerve, e.g. ptosis, with a dilated pupil on the same side, is almost pathognomonic of an ipso-lateral cerebral or cerebellar abscess.

In tuberculous meningitis one-fourth of the cases show a slight papillœdema; but tubercle of the choroid is much more frequent. Parsons believes that tubercle of the choroid is not so uncommonly found in tuberculous meningitis as is usually thought. It is often found only a day or two before death. Round yellow spots are seen near the optic disc, or, less frequently, scattered over the choroid.

In epidemic cerebro-spinal meningitis there may be a descending neuritis, causing a swelling of the head of the optic nerve with little œdema. Other eye symptoms are often found, e.g. conjunctivitis, swelling of the lids, photophobia, pupils unequally dilated or contracted, keratitis or ulceration of the cornea, or even a uveitis may be present.

During the past few years the epidemic disease known as encephalitis lethargica has been brought very prominently before the mind of the profession. Along with the acute

general infection there are found paralyses of the cranial nerves. The investigations of the Ministry of Health showed that 75 per cent. had some ocular palsy, ptosis was the most common defect; in 25 per cent. it was unilateral, papillœdema was rare.

Foster Moore did not find any fundus change in

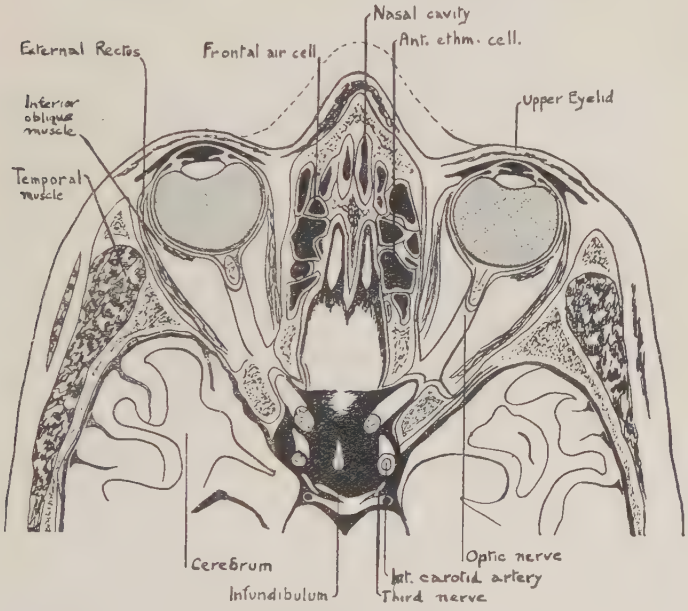

FIG. 32.—Horizontal Section through Middle of Orbital Cavities, Eyeballs, and Optic Nerves. Drawn by Miss M. E. Rea, B.A.

seventeen cases which he examined ophthalmoscopically. The ocular paralyses passed away soon, but some lasted as long as nine weeks after the onset of the disease. The writer has observed cases of failure of convergence, a defect which has remained permanently. The most advanced changes were found in the region of the third nerve nucleus in the mid-brain.

CHAPTER XV

THE ORBIT

The careful study of the accompanying illustration (Fig. 33) will amply repay the reader. It is not often from a single picture that one can so rapidly revise one's knowledge of the orbital and nasal regions. The late Professor Johnston Symington, of Queen's University, Belfast, was a past master in the art of making specimens illustrating sectional anatomy. The illustration is taken from one of his drawings. This was a coronal section of the head of an adult male, $2\frac{3}{4}$ inches in front of the external auditory meatus, looked at from behind. The eyeballs have been cut through close to the equator, so that in this specimen the anterior half of each eye is preserved. The posterior surface of the cornea, iris, ciliary body, and most anterior part of the retina are seen inside the sclera of each eye, and one sees also the cut surfaces of the muscle and nerves together with the orbital fat all enclosed within a bony capsule which is simply a section of the bony orbit. Notice the thin shell of bone which separates the orbital from the nasal cavity. The large air space below the orbit is the maxillary antrum. The thin dark space above the orbit is the frontal sinus, the latter is separated from the cranial contents merely by a thin layer of bone. The orbital cavity narrows posteriorly as far as the optic foramen, through which the optic nerve passes. Anteriorly the orbital cavities are closed by the eyelids.

Injuries of the Orbit

Severe fractures of the orbital margins or walls may take place without any injury whatever to the eye. The writer

has seen the malar bone crushed back into the antrum through a heavy object striking the face in front without the slightest damage to the eye. A soldier at a tournament was swinging the 16-pound hammer preparatory to throw-

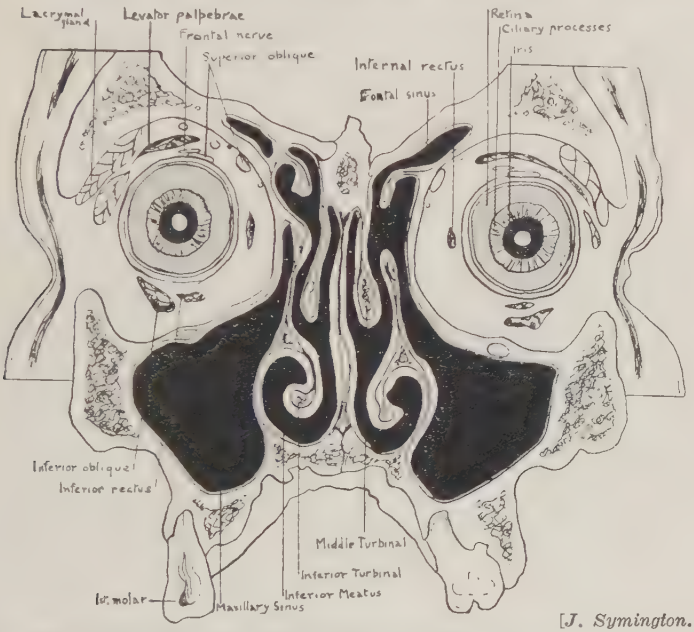

FIG. 33.—Coronal Section of Head of Adult Male, 2¾ inches in front of External Auditory Meatus, viewed from behind.

ing it when a drill instructor suddenly turned round and received the weight of the hammer full in the face. Both superior maxillæ and malar bones, together with the nasal bones, were dislocated, yet a few weeks later the patient was discharged from hospital without any damage to his eyes or their adnexa.

FRACTURES

If, however, a fracture extends into the optic foramen, injury may be caused to the optic nerve; there is instantaneous blindness, although the optic disc does not become pale until several weeks have elapsed.

A patient fell forwards going up a stone staircase and struck her head against a sharp edge. There was a large, loose piece of bone found beneath the eyebrow; there was a good deal of swelling due to œdema and hæmorrhage. She was kept at rest, and in a few weeks the loose piece of bone had completely united without deformity. So long as such fractures are not compound, there is little fear of permanent damage.

Gunshot Wounds

During the war a great variety of gunshot wounds were seen. In my book on *Chest Radiography* there is an illustration showing a bullet which entered the skin of the back, passed upwards through the sternomastoid muscle, and finally came to rest at the posterior portion of the orbit. Sometimes a bullet was found to have traversed through and through both orbital cavities, severing both optic nerves, but more often it severed one optic nerve and completely disorganised the eyeball on the opposite side. However, in civil life, the commonest forms of gunshot wounds are caused by fine shot entering the orbit in front. Sometimes the best treatment for this condition is masterly inactivity. The duty of the surgeon is to demand a radiogram of the skull and ascertain the depth and position of the foreign body. The nerves contained in the orbit are so fine that the slightest rough handling would cause permanent injury to the use of the eye. One case showed complete ptosis or drooping of the upper eyelid which followed the entry of a small leaden shot through the eyelid and which had tracked along the roof of the orbit as far as the sphenoidal sinus. The power to raise the eyelid recovered, the shot still remains *in situ* and has done no further damage; it is actually $2\frac{3}{4}$ inches deep to its point of entry and is separated from the brain membranes by a thin layer of bone.

Infections of the Orbit

Infections of the orbit may be primary or secondary. A glance at Fig. 33 shows the infection may take place in the

PLATE VI

[*R. Lindsay Rea.*

CASE OF RECOVERY FROM PSEUDO-TUMOUR OF THE ORBIT.

Case when first seen. Eyes are protruding, so that lids will not meet. Conjunctivæ greatly swollen and chemosed. Vision of left eye nil.

fat surrounding the eyeball. It is more difficult for the pus to track backwards than forwards, so that a swelling is usually noticed beneath the eyelids and this is the place where the abscess will point. Suppose one of the ethmoidal sinuses becomes infected, the thin, weak, shell-like bone will expand and finally burst, the pus finds its way from the sinus into the orbital cavity. An eye which had begun to protrude was examined by an oculist and a rhinologist. From various methods of inspection, neither could gain any knowledge as to the cause, but a radiogram taken antero-posteriorly showed the middle of the ethmoid wall swollen and pushing outwards into the orbital fat. The rhinologist dealt with the sinus from inside the nasal cavity, with the happy result that the eye went back into place. Infections caused by the staphylococcus, streptococcus, tubercle bacilli, etc., may occur, causing a periostitis of the walls of the orbit or an abscess tracking through the orbital cavity. Plate VI depicts a case of pseudo-orbital tumour; this was due to gummatous periostitis, syphilis having been contracted four years previously. The infection was blood-borne and was spread by means of the anastomosis between the ethmoidal branches of the ophthalmic artery and the alveolar branches of the internal maxillary. Fig. 33 explains the course of the disease. Gradually the left eye began to protrude, vision was lost, then the right eye began to come forward also. Most fortunately, by means of strenuous anti-syphilitic remedies, in six months' time there was complete recovery. Again, at the expense of repetition, let it be said that the use of mercury and iodides alone in ocular syphilis is not justifiable. It is necessary to induce the rapid action of the various arsenical preparations in order that the destruction of the spirochætes should take place before permanent damage is done to the organ of vision. It was only by using neoarsenobillon every fifth day, injected into the veins of the arm in doses beginning with a ·45 gram, but never above ·6, that such a magnificent cure was obtained. Long after the injections, and when there was apparent recovery, mercury and iodides were

continued, until at the end of two years the blood showed a complete negative Wassermann reaction.

From what has been said it is not difficult to remember the diagnosis of orbital cellulitis :

(1) The eye protrudes (exophthalmos).

(2) The eyeball is fixed.

(3) The conjunctiva is swollen and chemosed.

There is usually considerable pain together with a raised temperature. Even should one eye only protrude, if it is freely movable and the conjunctiva remains white, the case most probably is one of exophthalmic goitre. However, a unilateral exophthalmos is not common, but this must be borne in mind. One form of infection which seriously affects the orbital contents is that of suppuration of a neighbouring sinus, say a frontal sinus. If there is no escape for the pus, apparently a severe toxæmia ensues, complete paralysis of the nerves within the orbital cavity, including the optic nerve, can take place, with the result the eyelid will fall down (ptosis) and when raised by the finger the eyeball will be found rotated downwards and slightly proptosed. The eye is blind while a papillœdema of the optic disc is seen by the ophthalmoscope. In such a case, if the sinus is thoroughly drained, complete recovery takes place within three months, yet all this while there has not been any evidence of pus having entered the tissues surrounding the eyeball.

Should an apparent case of orbital cellulitis come to the notice of the general practitioner, he should never forget the possibility of a thrombosis of the cavernous sinus taking place. The infection is carried to the cavernous sinus by means of the ophthalmic veins, the condition is severely painful owing to the branches of the ophthalmic division of the fifth being involved, the cornea becomes anæsthetic, and such a case is practically always fatal.

Tumours

In infants dermoid tumours are often found and chiefly situated above the inner canthus; they may also appear

at the outer canthus, but in the latter position they must be diagnosed from a meningo-encephalocele: the latter will communicate with the cranial cavity and contain cerebro-spinal fluid. Dermoids are easily removed, they must be dissected out thoroughly; also angiomata, osteomata, and neuromata are found. A recent case seen at the Western Ophthalmic Hospital of von Recklinghausen's disease was found to have a plexiform neuroma growing in the orbit.

The malignant tumours are usually sarcomata and carcinomata, also metastases from cancer in other parts of the body are deposited sometimes within the orbit. The only treatment for such is complete evacuation (exenteration) of the orbit. In this operation the orbital contents are separated from the bony walls by periosteal elevator and completely removed, leaving but a pedicle at the apex of the orbit.

CHAPTER XVI

THE HYGIENE OF THE EYES

Considering the object of this book it would most probably be of the greatest usefulness to include a chapter which deals with the care of the eyes during the various stages of life. When reading an account of the various diseases of the eye, it is felt that some facts concerning the hygiene of the eye must be mentioned before one considers such a book as being in any wise complete.

Parents are often puzzled concerning the welfare of the eyes of their children, and wonder to what extent the eyes can be used, say during education, when consideration has yet to be given to the ultimate use of the eye in the earning of a livelihood. The family physician is the one consulted, so the author will endeavour, as briefly as possible, to state some facts that should be known.

We will begin when the child is yet unborn. The disease we dread most in the mother of an unborn child is undoubtedly syphilis. During the past few years treatment has been given both in Europe and America to large numbers of pregnant mothers, and the statistics that are accumulating throw considerable light on the value of such treatment. Changes occurring in the development of the fœtus from the second to the fourth month show that normal processes are affected profoundly in the embryonic tissue (which will eventually become the bony skeleton and teeth) by the presence of the syphilitic virus. At what age is the anlage of the permanent incisor teeth found? Microscopic sections show the dental layer of epiblastic cells as early as the sixth or eighth week. The formation of the bones in the skull are commencing about this time, so that when a

syphilitic child is born there are already extensive changes and erosions which are seen in the child and adult later on, such as notched teeth, a fallen-in bridge or perforated palate. In a case the author knew of the patient wore a cork in his palate to enable him to speak. And yet such a child no intelligent parent would ever wish to produce. Hence it is of extreme importance, should the slightest evidence of syphilis be present, for the mother's blood to be examined.

Referring back to the chapter on Interstitial Keratitis, it is mentioned that when a child affected with interstitial keratitis is brought to the oculist, the parents' blood should be examined. Seldom does one find a negative Wassermann reaction in such cases. The following is quoted from Charles C. Dennie's book on *Syphilis*: "According to Williams, 26·4 per cent. of seven hundred and five fœtal deaths occurring in ten thousand consecutive pregnancies were due to syphilis. Routine Wassermann tests in pregnant mothers show from 8 to 10 per cent. positive reactions." It has been proved that the mother who from the commencement of her pregnancy has had adequate treatment should produce a healthy, normal child. As regards the amount of treatment, this should be left to those who specialise in such work. The results, however, up to the present are extremely encouraging. To avoid the onset of such a disease of the eyes as interstitial keratitis, which requires at least two years' treatment, together with the probability of more or less complete deafness for which treatment avails little, it should be sufficient to stimulate the minds of parents to do all they can to avoid the birth of a congenital syphilitic child.

It is not an uncommon thing, unfortunately, for some mothers to attempt the abortion of the child. Should such measures fail and should the mother have shown poisonous symptoms signs of such may be found in the living child. One definite case has come before the author's notice. It was a history of taking "steel drops," the prostration of the mother from poisoning, the failure to bring

about the desired end, and later, a child born at the normal time. One eye was very poorly developed and of no use whatever as an organ of vision.

There are many ways in which the eyes of the fœtus can be affected, but the healthy mother who is given a chance of quiet, rest, sufficient exercise, sufficient food, absence from nicotine and alcohol (which are powerful nerve poisons), should have no apprehension as regards the result of bringing a child into the world.

The next step that must be considered is the birth of the child, and here cleanliness is the chief factor in saving eyes where gonorrhœal discharge has been present. Tweedy and Wrench's method of vaginal douching in the second stage has been described, also the installation of 1 per cent. Silver Nitrate. It is not sufficient, in the author's opinion, for either the doctor or midwife to use weak solutions of organic silver preparations. Silver Nitrate should be used, and it is the one exception where such should be used as drops. The eye is not in a state of inflammation, and therefore there is no danger to the cornea, but notwithstanding, after the installation of Silver Nitrate drops, the conjunctival sacs should be washed out, preferably with lukewarm Boracic lotion. It is a great relief to the mind of a woman who has contracted gonorrhœa to know that in spite of this a healthy child can be born to her, but the doctor in charge of the confinement should take special precautions against infection entering between the eyelids.

An infant will rub or scratch his eyes with fingers or nails; therefore for a few weeks the little one should have his arms held down to the side by means of a shawl. The eyes should be washed at bath-time with a few drops of Boracic lotion, preferably with the chill just taken off the cold water.

Direct sunlight should not be allowed to fall upon an infant's eyes. Some parents go to the trouble of lining the hood of the pram with dark green material. This is really a mistake, as the contrast of looking at a dark colour and then a bright sky is too great. Further, it is an

interesting fact that an infant delights to look at electric lights without any apparent discomfort, and certainly without any after-effects, yet direct sunlight allowed to fall on the eye of an infant or adult is most harmful. The best place for an infant is out of doors. Many a mother, acting on the advice of the doctor, is surprised to find that a child, whom she has guarded carefully indoors in the nursery and has kept away every breath of wind from blowing on the child's face, if kept out of doors all day and fresh air be freely admitted to the nursery at night, has improved immeasurably by such care. It is now well known that exposure to the sunlight and fresh air helps in the formation of pigment. Hence those children who are born with fair hair, pale skins, and whose retinæ show thin pigmentation, gain distinctly in eyesight and in general tone. The author has had under his care twins who were born blind: their eyes closely approximated to what is known as the albinotic state. A year in the fresh air and sunlight produced such a change that the use of the eyes became evident, and the improvement has continued since. Whole families have the same history of children being born fair with poor eyesight, but as the hair darkens so the pigment of the choroid and retina of the eye is increased, and vision is therefore improved.

At what age should a child be permitted to go to school? One author has recently put it at eight years of age. His fear is that a younger child looking at toys, pictures, pages of books, etc., runs the risk of becoming short-sighted, yet the author of this little volume attended school before three years of age without the slightest harmful results to eyes or health. The question cannot be answered in the same manner for each child. A child born of myopic parents should be carefully watched during the earlier years of life. Outdoor amusements, rather than picture books, should be the rule, and the time for his first attendance at school should certainly be delayed. In spite of such care, if a child with or without an hereditary disposition to myopia is allowed to read in bed, the chances are the eyes will

become myopic. The worst cases of progressive myopia are found in children pursuing this habit. Obviously, then, a child should be taught that bed is for sleep, and the amount of sleep should be in no way curtailed.

Regarding conditions of lighting, etc., in schools, the doctor in charge has many works to which he can refer for information. One I would specially mention is *Lighting in Relation to Public Health*, by Janet Howell Clark, of the John Hopkins University. There is a general rule which should be adopted by one and all, and that is, light should fall on the page of the book from behind, whilst reading should not be pursued in a dim light. Reading lamps which shed a cone of light on the desk, leaving the remainder of the room in semi-darkness, should be avoided. Electric light or incandescent gaslight is the most suitable artificial light for study. A hospital was found where a cone of light fell on each bed; immediately outside this cone was darkness. The patients were suffering chiefly from nervous diseases, and the effect can easily be imagined. Where there are white or steel-blue ceilings, reflected electric light is the best illuminant.

A great many schools insist upon the eyesight of each new scholar being examined, but they often omit to examine the sight of these children after their education has proceeded for a few years. At one school, the Committee in charge were surprised to find that many of the children who were permanent boarders had acquired short-sight, or were using only one eye and, in some cases, actual disease had gone on insidiously within the eyeball. The lesson learned was a valuable one, for the efficiency of the nation depends greatly on the protection and examination of the eyesight of children of all classes.

When the epidemic "pink eye" breaks out in a school, those children suffering from this disease, which is a muco-purulent conjunctivitis, should be segregated, not allowing the slightest chances of towels, etc., being exchanged. Seven cases were reported in a school of over four hundred children, all of whom boarded at the school. Segregation

of these seven, together with prompt treatment, arrested the epidemic, whilst in a neighbouring town five schools were closed due to the contagious spread of this disease.

The same precautions regarding sanitary arrangements and clothing should be taken in a house where either parents or children are affected. If a mother is nursing a baby suffering from ophthalmia neonatorum she must take the utmost precaution against clothing soiled by discharge touching her face. Men, too, suffering from urethral discharge should be warned to exercise the utmost precaution against the transference of the discharge to the eye. May it be repeated that where the eye of a child can resist the severest gonorrhœal infection, it is with the utmost difficulty that an adult's eye can do so.

What advice should the general practitioner give to the parents of a schoolboy or schoolgirl suffering from a squint? Should the question of an operation be mentioned? Enquiry if glasses have not been worn, or how long if they have been worn, should be made, and also if the sight has been tested and a pronouncement made as to whether the eye should or should not be straightened. The disadvantages of a squint in the case of a boy are most serious. The choice of an employer from a number of boy applicants is greatly influenced by such a deformity, or a young girl growing into womanhood is seriously handicapped by the presence of a so-called "cast." In past years, when errors of refraction were largely overlooked and a squint was looked upon as an incurable condition, children who had inherited hypermetropic eyes, and due to this condition alone had acquired a squint, always stated in after life that they had inherited this deformity. The truth is they had merely inherited that condition of the eye which, due to the absence of proper correction of the error of refraction, resulted in a squint.

Even in the case of a paralytic strabismus, it is worth while having the eye as straight as possible. The advice should never be given that a child will grow out of his squint. If by means of glasses the deformity is corrected,

parents should still be warned that if the glasses are left off before permission is given by the oculist the squint will return.

The boy will proceed from school to the workshop, or office, or the university. In the workshop, where dust is prevalent in the atmosphere, or through handling of tools some grit enters the eye, it is a golden rule that if such happens the eye should not be rubbed. In one case a workman was sinking a shaft in the middle of the road, and while glancing up a strong wind blowing at the time lifted the dust from the surface of the road, some of which blew into his eye. Promptly dropping his shovel, he tried to rub the grit away. Small, sharp, flinty substances caused fine abrasions on the cornea, the infected road dust set up inflammation, and when the patient was seen the eye was irreparably blind. It is much the better plan to keep the lid closed until some water can be obtained wherewith to wash out the conjunctival sac.

A similar accident can happen on the golf course in dry weather, when the ground is hard and the player in using an iron strikes sharply into the ground. A piece of hard clay has been known to hit the eyeball and literally explode into fine granules, filling the fornices of the conjunctival sac. One such player was lucky in having an intelligent caddie who fortunately was able to remove as much as possible with a soft silk handkerchief, while the remainder of the dirt was washed out with warm water at the clubhouse. No ill-effects followed.

The lighting conditions are just as important in the workshop as in the office, but it is notorious that so many workshops have extremely poor illumination provided. Workshops that are well lit make for cleaner and healthier conditions of the workmen. Wherever possible Vita Glass should be employed. It is highly improbable that the doctor will see boys at work in the office or when studying at the university. Nevertheless, it should be borne in mind that faulty posture will produce softening, followed by myopic change in the eyeball. In large offices, where

hundreds of men and women are employed, the number of cases which present themselves suffering from acquired myopia is truly remarkable. Whatever the error of refraction may be and no matter how little, glasses providing a correction should be employed. Students who spend the whole day in study find from experience that even the correction of a quarter of a dioptre of astigmatism is well worth while.

Should reading be allowed whilst riding in cars, trains, etc. ? While it is an easy matter to state that such should be discouraged, when one realises how many thousands of people in a great city spend hours each day travelling to and fro, permission must be granted, and something provided which will minimise any possible harmful results. This something is the proper correction of any error of refraction which may exist.

Cinemas cannot be blamed for producing defects of eyesight—they are rather to be praised for revealing them. Quite a large proportion of children admit they cannot read the subtitles on the screen as well as their parents and others can. No one should be permitted to sit close to the screen, as there the flicker is observed at its worst, and this produces extreme fatigue of the eyes, which is most distressing.

A question often arises in the mind of a university student—does smoking harm the eyes ? At the average time of life of a university student it is not the optic nerve that shows symptoms of nicotine poisoning. The author found it his duty at the beginning of the Great War to examine university students who wished to enter the Navy. In one cases it was the nerves of the heart which showed poisoning, the pulse reading was 120, while three months later, during which time smoking was not permitted, the heart-beat had become normal. The same recovery is found in patients of middle age when the sight shows indications of the same poisoning.

The eyes require cleansing, but not as has been stated by some, as frequently as the skin of the face. The eyelids by their action wash the lacrimal secretion across the eye-

ball, and not only by this mechanical action, but by the lyzozymic action of the tears, the conjunctival sac is cleansed. Nevertheless, fine grit will become adherent, and before it is removed can infect the fine surface cells of the conjunctiva. Therefore, those who are exposed to wind or dust should bathe the eyes at night with simple Boracic lotion, and where much motoring has to be done, a trace of Zinc, as has been mentioned in Chapter II, should be employed. Students who are using their eyes for close work all day cannot do better than relieve the congestion of the eyes at night by the use of Boracic and Zinc, but not more than 1 gr. of Zinc Sulphate should be used to the oz. If this were done once or twice weekly, it would be sufficient to keep the eyelids healthy.

The average age for a normal individual to begin the use of glasses for reading is forty-five years. From this time onwards the care of the eyes should have special attention. Improperly corrected errors of refraction have been found to cause the early appearance of cataractous opacities. The anterior chamber of the eye has grown somewhat shallower, so that raised tension may have been creeping on insidiously. The greatest care has to be taken when instilling a mydriatic for examination purposes, for even weak Homatropine, by retracting the iris into the corneo-iridic angle, can produce a rise of tension which is manifested by a dilatoriness of the iris to resume the normal size of the pupil, and in some of these cases of raised tension Eserine has little or no myotic effect.

Furthermore, it is at this time of life that a knowledge of one's blood pressure is of great importance. The fundus of the eye is one of the finest aids we have in diagnosing the condition of the cardio-vascular system. Early arterio-sclerosis of the vessels can be seen by the ophthalmoscope. When one's occupation all day is the continual examination of eyes, a certain degree of expertness can be acquired which at first glance would seem to be impossible. One has tried to judge the blood pressure of various patients seen at hospital by merely using the ophthalmoscope, obviously

a very difficult diagnostic test. One case where the blood pressure was judged to be in the neighbourhood of 200 millimetres, it was found to be 300. Truly, this was an exceptional case. The illustration merely suffices to show that the examination of the eye is of the utmost importance in judging the health of the patient.

There are many instructions which the oculist must give to a patient, yet one simple one must be remembered. Patients of middle age, who wear thick concave lenses, showing subjectively that they are the victims of a high degree of myopia, should be warned against violent movement, jumping off a rapidly moving vehicle, lifting heavy weights, severe coughing, etc. All of these have been known to be the causal agent, time and again, of detached retina in such an eye.

To the doctor himself one would give a word of warning on the use of ultra-violet light apparatus. The simplest accident, apart from those due to actual faults of the apparatus, is the exposure of the doctor's unprotected eyes to the light. An illustration will best serve our purpose here. A doctor friend, whilst attending to the readjustment of his lamp, did not take the precaution of wearing his smoked glasses. For some time his eyes received the full exposure of the light. This occurred in the afternoon. At ten o'clock at night the pain of both eyes was agonising, it was impossible to open the lids, and only after a liberal installation of 5 per cent. Cocaine could an examination be made. By means of fine staining it was found that the whole of the surface epithelial cells of the cornea were destroyed. In a week's time these cells had regenerated, and he was able to resume work. The doctor never omits now to put on his protective goggles during an exposure to ultra-violet light.

In advanced age the tissues of the body show considerable changes, the eye not escaping. How often one sees chronic conjunctivitis in an old patient which appears to be almost incurable, and goes on from day to day until the eyelid becomes inverted or everted. Ulcers may appear on the

cornea, and the tissues, apparently not having the power to resist the invasion of disease as would normal tissue in a younger patient, prove most resistant to treatment. Changes are proceeding in the structure of the crystalline lens of the eye, and although there may be no sign of cataract, yet when light is thrown on the eye the surface of the lens reflects the light in such a manner as gives the lens the appearance of cataract. It naturally follows that advice to an elderly patient about to take a journey involving long distance by car should be given. The eyes should be protected by goggles, and extremes of cold and heat should be avoided.

In concluding this chapter I would like to remind my readers of the importance of protecting the eyes during the administration of a general anæsthetic. If there is the slightest suspicion that the anæsthetic, either in vapour or liquid form, has entered between the eyelids, the eyes should be at once washed with lukewarm boracic lotion.

If perchance the surface of the eye has been burned by the anæsthetic, then the eye should be treated with boracic lotion and an ointment composed of atropine $\frac{1}{2}$ per cent. and boracic acid 10 per cent. The eye should be bandaged.

An elderly patient may turn to his doctor for advice regarding the removal of cataract. Is eighty years of age too old for an operation? A doctor's mother, aged ninety-three years, had her cataract painlessly removed, and lived to enjoy her new-found sight. The answers to these questions are best decided by a consultation between the general practitioner and the ophthalmic surgeon. Herein indeed lies the care and the safety of the eyesight of the nation. He is a wise man who seeks to augment his own learning from the study and experience of others, especially from those trained as highly as is humanly possible in the knowledge and care of the body. In a country such as ours, with all its charitable institutions staffed only by such men, there is no excuse for anyone seeking and adopting the advice of untrained men, and particularly is this so in the realm of ophthalmology.

THERAPEUTIC FORMULÆ

OINTMENTS

Conjunctivitis

℞ Pulv. Ac. Boracis . . . grs. xl
Paraffin Molle . . . . ℥ i
Sig.—To be placed by means of a glass rod into conjunctival sac behind lower eyelid at bedtime.

Phlyctenular Conjunctivitis

℞ Pulv. Ac. Boracis . . . grs. xl
Hydrarg. Ox. Flav. . . . grs. ii
Paraffin Molle . . . . ℥ i
Sig.—To be placed by means of a glass rod into conjunctival sac thrice daily.

℞ Pulv. Ac. Boracis . . . grs. xl
Hydrarg. Ox. Flav. . . . grs. ii
Atropinæ . . . . . gr. i
Paraffin Molle . . . . ℥ i
Sig.—To be placed by means of a glass rod into conjunctival sac thrice daily.

Chronic Conjunctivitis

℞ Pulv. Ac. Boracis . . . grs. xl
Atropinæ . . . . . grs. ii
Paraffin Molle . . . . ℥ i
Sig.—To be placed by means of a glass rod into conjunctival sac behind lower eyelid thrice daily.

Blepharitis

℞ Hydrarg. Ammon. . . . grs. viii
Paraffin Molle . . . . ℥ i
Sig.—To be massaged into roots of eyelashes night and morning.

Septic Conditions of Eyelids
(Batten's Ointment)

℞ Unguent. Hydrarg. Ammon. . ℥ ii
Liq. Picis. Carb. . . . ♏. xx
Paraffin Molle . . . . ℥ ii

Sig.—To be rubbed into skin nightly.

℞ Resorcin . . . . . grs. ii
Paraffin Molle . . . . ℥ ii

Sig.—To be applied to skin nightly.

Trachoma

℞ Cupri. Cit. . . . . grs. v
Paraffin Molle . . . . ℥ ii

Sig.—To be used as eye-ointment night and morning.

Iritis

℞ Atropinæ . . . . . gr. i
Paraffin Molle . . . . ℥ ii

Sig.—To be applied to eye thrice daily.

Iritis (if Atropine causes irritation)

℞ Hyoscinæ . . . . gr. ½
Paraffin Molle . . . . ℥ ii

Sig.—To be applied to eye night and morning.

Acute Glaucoma

℞ Eserinæ . . . . . gr. ½
Paraffin Molle . . . . ℥ ii

Sig.—To be applied to eye twice or thrice daily.

LOTIONS

Simple Conjunctivitis

℞ Pulv. Ac. Boracis . . . grs. xvi
Aq. Rosæ . . . . ℥ i

Sig.—To be used as eye-lotion frequently.

Muco-Purulent Conjunctivitis

℞ Lotio Hydrarg. Perchlor. . . 1 in 5,000

Sig.—To be used with an equal quantity of warm water as eye-lotion thrice daily.

Angular Conjunctivitis

℞ Pulv. Ac. Boracis . . . grs. xvi
Zn. Sulph. . . . . gr. i
Aq. Rosæ . . . . . ℥ i

Sig.—To be used with an equal quantity of warm water at first, later full strength, thrice or more times daily.

Blepharitis

℞ Sodium Bicarb. . . . . grs. xii
Aq. Dest. . . . . ℥ i

Sig.—To be used with small amount of boiling water as solvent for scales of eyelashes.

DROPS

Angular Conjunctivitis

℞ Zn. Sulph. . . . . gr. ½
Aq. Rosæ . . . . . ℥ iv

Sig.—To be dropped into conjunctival sac thrice daily.

℞ Pulv. Ac. Boracis . . . grs. xvi
Zn. Sulph. . . . . gr. i
Aq. Rosæ . . . . . ℥ i

Sig.—To be dropped into conjunctival sac thrice daily.

Muco-Purulent Conjunctivitis

℞ Guttæ Protargol or Argyrol . 5%

Sig.—To be used thrice daily (for limited time).

℞ Guttæ Protargol or Argyrol . 20%

For use ONLY in Surgery as paint for conjunctival surface of eyelids once daily.

Iritis

℞ Homatropinæ Hydrobrom. . . } aa. 2%
Cocainæ Hydrochlor. . . . }
Aq. Dest. . . . . .

Used to dilate pupil and paralyse accommodation, also in the diagnosis of iritis.

℞ Atropinæ Sulph. . . . grs. ii
Aq. Dest. . . . . ℥ iv

Sig.—To be dropped into conjunctival sac thrice daily.

Iritis (if Atropine irritation is present)

℞ Hyoscinæ Hydrobrom. . . gr. ½
Aq. Dest. . . . . ℥ ii

Sig.—To be dropped into conjunctival sac twice or thrice daily.

For Surgery Use Only

℞ Cocaine Hydrochlor. . . . grs. xx
Aq. Dest . . . . . ℥ i

To be used as surface anæsthetic.

℞ Adrenalin Chloride . . . gr. 1/5
Chloretone . . . . gr. i
Sodium Chloride . . . grs. 1½
Aq. Dest. . . . . ℥ iv

To produce surface vaso-constriction.

N.B.—Neither Cocaine nor Adrenalin should be prescribed for patient's own use. This is the author's practice.

℞ Guttæ Argentum Nitrate . . 2%

Sig.—To be used in ophthalmia neonatorum as paint for conjunctival surface of eyelids.

It should never be prescribed for patient's own use.

Glaucoma

(used in the early diagnosis of Chronic Glaucoma)

℞ Pilocarpine Nitrate . . . gr. ½
Aq. Dest. . . . . ℥ ii

Sig.—To be dropped into conjunctival sac twice or thrice daily.

GLAUCOMA—*continued*

℞ Eserin. Sulph. . . . . grs. i or ii
Aq. Dest. . . . . ʒ ii

Sig.—To be dropped into conjunctival sac twice or more times daily.

EPISCLERITIS (Rheumatic)

℞ Sod. Salicyl. . . . . grs. iv
Chloretone . . . . gr. ½
Glycerin . . . . . ♏. s. v
Aq. Dest. . . . . ℥ i

Sig.—To be dropped into conjunctival sac thrice or more times daily.

MIXTURES

TONIC TREATMENT

℞ Ferri et Ammon. Cit. . . . grs. v
Liq. Sod. Arsenatis . . . ♏. iii
Aq. Chlorof. . . . . ad. ℥ ss

A tablespoonful thrice daily in a little water after meals together with open-air treatment.

℞ Sod. Bicarb. . . . . grs. xv
Tinct. Nux Vom. . . . ♏. v
Spt. Chlorof. . . . . ♏. v
Inf. Gent. Co. . . . . ad. ℥ ss

A tablespoonful thrice daily with food.

℞ Ferri Sulph. . . . . grs. ii
Mag. Sulph. . . . . grs. xx
Ac. Sulph. Dil. . . . . ♏. x
Aq. Menth. Pip. . . . ad. ℥ ss

A tablespoonful twice or thrice daily in a little water after meals.

℞ Liq. Strychnin. Hydrochlor. . ♏. iii
Ac. Hydrochlor. Dil. . . . ♏. xii
Syrup Aurant . . . . ʒ i
Inf. Gent. . . . . ad. ℥ ss

A tablespoonful twice or thrice daily in a little water after food.

TONIC TREATMENT—*continued*

℞ Quinin. Sulph. . . . . gr. i
Ac. Sulphurici Dil. . . . ♏. v
Aq. Dest. . . . . ad. ℥ ss

A tablespoonful twice or thrice daily in water after food.

BLOOD PRESSURE, SYPHILIS, TOXIC CONDITIONS, ETC.

℞ Pot. Iod. . . . . grs. v
Sod. Iod. . . . . grs. v or x
Spt. Ammon. Aromat. . . ♏. xv
Spt. Chlorof. . . . . ♏. vii ss
Inf. Gent. Co. . . . . ad. ℥ ss.

A tablespoonful thrice daily in water before or after food.

℞ Pot. Iod. . . . . grs. x or xv
Liq. Hydrarg. Perchlor. . . ♏. xxx
Tinct. Nux Vom. . . . ♏. v
Aq. Chlorof. . . . . ad. ℥ ss

A tablespoonful thrice daily in water before or after food.

℞ Hydrarg. c. Creta . . . 1 part
Sod. Bicarb. . . . . 2 parts
Pulv. Rhei Co. . . . . 3 parts

Dose as directed.

℞ Sod. Bicarb. . . . . grs. x or xv
Sod. Salicyl. . . . . grs. x or xv
Inf. Calumb. . . . . ad. ℥ ss

A tablespoonful thrice daily in water after food.

APERIENTS

℞ Mag. Sulph. . . . . grs. xlviii
Mag. Carb. Levis. . . . grs. xv
Aq. Menth. Pip. . . . ℥ i

(Mist. Alb.)

Take a dose in a little water as directed in the morning.

℞ Extract. Cascaræ Sagrad. Liq. } aa. ℥ i
Extract. Glycyrrhizæ Liq. }
Sod. Bicarb. . . . . grs. v
Aq. Chlorof. . . . . ad. ℥ i

Take half or whole amount in a little water when required at night.

APERIENTS—*continued*

℞ Pil. Colocynth Co. . . . grs. iv
Ext. Hyoscyami . . . gr. ½
Ext. Belladon. Vir. . . . gr. ⅓
Resina Podophylli . . . gr. ¼
Ft. pil.

Take one at night as required.

℞ Pil. Alophen (Parke Davis).

SYPHILIS

℞ Pil. Hydrarg (Blue Pill) . Dose, iv to viii grs.

℞ Pil. Hydrarg. Subchlor. Co. (Plummer's Pill) . . . Dose, v to x grs.

SEDATIVE

℞ Pul. Opii . . . . . gr. i
Extr. Belladon. Vir. . . . gr. ¼
Ft. pil.

One to be taken as directed.

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